Pollution Prevention Assessment Manual

A Guide for a Source Reduction and Waste Minimization Plan Required Under the Waste Reduction Policy Act of 1991

Contains the Waste Reduction Policy Act (SB1099) and Pollution Prevention Rules 30TAC S335, Subchapter Q

Texas Natural Resource Conservation Commision

RG-133
(formerly LP92-03)
October 1995
printed on recycled using soy base ink

This document is provided by the Texas Natural Resource Conservation Commission (TNRCC) to assist businesses and industries in preparing a Source Reduction and Waste Minimization assessment plan.

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Published and distributed
by the
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

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Pollution Prevention Makes Good Business Sense

The world we have created today as a result of our thinking thus far has problems which cannot be solved by thinking the way we thought when we created them. — Einstein

Pollution prevention **does** make good business sense and **it's the law in Texas.** Requirements from the Waste Reduction Policy Act (WRPA) of 1991 require industries and businesses who generate hazardous waste and/or release toxics to prepare a Source Reduction and Waste Minimization (SR/WM) Plan and a SR/WM Annual Progress Report. This manual will focus on the preparation of the SR/WM Plan. Guidance on preparation of the SR/WM Annual Progress Report can be obtained by ordering the instruction manual, RG-112 (see Appendix F).

This manual is organized to accomplish two objectives, first, to aid companies in planning, developing, and implementing a successful SR/WM program and, second to aid facilities in preparing a SR/WM Plan as required under WRPA. Chapters 2 through 5 present worksheets that will help you plan, develop, and implement a SR/WM program. Chapter 6 presents three detailed approaches for preparing the written plan as required by WRPA. The first of these approaches draws from the worksheets presented in Chapters 2 through 5. The rules governing Source Reduction and Waste Minimization Planning are included in Appendix A of this Manual: 30 TAC §335, Subchapter Q. The Waste Reduction Policy Act (WRPA), Article 2, is included in Appendix B.

Why Start a Pollution Prevention Program in Texas?

Pollution prevention is an essential element of the State's immediate and long-term strategy to manage hazardous waste and reduce pollutant releases to the environment. Land disposal will continue to be a disposal option but due to stricter regulation, its role is diminishing at both the state and national level and, at least in the near term, capacity of landfills is limited. EPA's program of land disposal restriction, established in response to the 1984 Hazardous Solid Waste Authorization (HSWA) amendments to the Resource Conservation and Recovery Act (RCRA), will ban the disposal of any untreated hazardous waste. Treatment technologies offer another option, but treatment can be expensive, so generators must explore other options.

There are many reasons to reduce both the amount of waste generated and the amount of toxic releases to the environment. The following pages will discuss five important incentives:

1. Economic incentives – It pays to reduce waste.
2. Regulatory incentives – It's the law.
3. Liability incentives – It's your responsibility.
4. Public Benefit – It's the right thing to do.
5. Human Health and the Environment – It's our future.

Economic Incentives

The biggest incentive for generators to reduce their hazardous waste and toxic releases is financial. Pollution costs, pollution prevention pays. As Tom Peters says in his video *Lean, Clean and Green* (Video Publishing House, Inc. 800-824-8889) "the companies that are cleanest first will enjoy a massive, once-in-a-century, competitive advantage." 3M realized the opportunities in pollution prevention and has saved approximately $575 million since 1975.

The cost of managing waste is escalating at a rate of 10 percent per year. Landfill closures and restrictions are increasing the price of disposal. Some waste which was once landfilled must now be incinerated. Currently, the cost for incinerating a drum of hazardous waste can run between 300 to 2000 dollars depending on the characteristics of the waste.

Companies must look beyond the up-front costs of pollution prevention and examine the whole spectrum of costs associated with pollution, including disposal, potential liability, and regulatory costs. Other benefits must also be considered that in an indirect way affect the company financially, such as improved public perception.

Regulatory Incentives

Regulations on pollution prevention have been increasing steadily since the 1980's and there is no reason to believe that this will decrease.

Waste Minimization is a policy specifically mandated by the U.S. Congress in the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA). This mandate and other RCRA provisions have led to unprecedented increases in the cost of waste management. As a result, generators of hazardous waste will be forced to examine other waste management alternatives, including waste reduction.

To ensure that companies are exploring possible Source Reduction actions, the Pollution Prevention Act of 1990 was signed. This federal act requires facilities that report under the Toxic Release Inventory (TRI) provisions of section 313 of SARA Title III to provide information on pollution prevention and recycling activities with each annual filing.

A similar action was taken by the 72nd Legislature of Texas through the Waste Reduction Policy Act (SB1099), which requires hazardous waste and TRI reporting facilities to have in place a Source Reduction and Waste Minimization plan. This manual was written to assist facilities meet the requirements of WRPA.

Among other changes, the EPA recently established the Toxicity Characteristic Leaching Procedure (TCLP), effective September 1990, which nearly tripled the number of the constituents to be regulated. More regulated waste usually means an increase in the cost of waste disposal.

New Federal and State laws and regulations limit waste management alternatives by eliminating or greatly restricting land-based disposal. In addition to the outright ban on certain disposal options and the increasing cost of all waste treatment and disposal, the managerial work required to comply with the environmental regulations can be costly to a business. Reducing the generation of hazardous waste can reduce compliance requirements as well. **Not generating hazardous waste at all is the best solution for avoiding regulation.**

Liability Incentives

According to RCRA, a hazardous waste generator is responsible for its waste from "cradle to grave". In other words, once a business generates a hazardous waste it's legally responsible for that waste forever. In addition, federal and state laws have set the precedent that generators of hazardous waste are at least partially responsible for the cleanup of wastes that have leaked from disposal sites containing their waste. This financial responsibility can cost hazardous waste generators substantial sums of money.

Generators using off-site treatment, storage, or disposal, face financial liability when the facility operators mismanage waste and when facility owners improperly design the disposal facility itself. Even careful evaluation of facility management cannot reduce these risks to zero. A generator risks incurring liability when the treatment, storage, or disposal facility (TSDF) owner does not pay for actions to stop migration of wastes in soil and ground water. In these situations, generators can be held liable under common law for absolute, strict, joint, and several liability. In addition, the imminent and substantial endangerment provisions in sections 106 and 107 of the Comprehensive Environmental Response, Comprehensive and Liability Act (CERCLA) say that a generator or generators can be held financially responsible for the entire cleanup or restoration of a facility.

The "cradle to grave" responsibility translates into what many insurance experts now call the "liability crisis". Liability insurance premiums have increased by 50 to 300 percent in the last several years due to the increase in law suits against hazardous waste generators involved in accidental spills and leaking disposal sites.

Increases in insurance costs or an inability to obtain insurance will result in higher treatment and disposal cost or the loss of available treatment or disposal capacity. One possible way to reduce this expense is to reduce the cause of the liability, which is the generation of hazardous waste. Reducing the hazardous waste a business generates will reduce its long-term liability.

Public Benefit

The public today is more informed about environmental issues. They are aware of the potential effects that hazardous waste and the release of pollutants can have on human health and the environment. Therefore, companies that are environmentally aware and work towards waste reduction can improve their working relationship with the public - their neighbors and their customers.

Human Health and the Environment

The most important reason to promote pollution prevention is to protect our health and the environment that we all must live in. When we improve and protect the environment we are ultimately protecting ourselves, our children and grandchildren.

What is a Pollutant or Contaminant?

A pollutant or contaminant includes anything that could cause harm to an organism or its offspring through exposure to a release into the environment. An example is a substance entering humans through the food chain (ie. pesticide residue ingested by cattle and later transferred to humans). Another example is the disposal of toxic substances into a drainage system (ie. paint thinner poured down a septic tank or wastewater sewer system). For a complete definition of pollutants and contaminants, see Appendix A.

What is Hazardous Waste?

Hazardous wastes are a subset of solid wastes. Basically, a solid waste is a liquid, solid, semisolid, or gaseous material that is either no longer wanted or no longer fit for its intended purpose (see Federal 40 CFR Part 261 for exemptions).

Federal (40 CFR Part 261) and Texas (TAC, Chapter 335) regulations define a solid waste as hazardous if it has one or more of the following **characteristics**.

Ignitability - ignitable hazardous wastes can burn under certain conditions.

Corrosivity - corrosive hazardous wastes include those that are acidic and those which can rapidly eat away (corrode) steel.

Reactivity - reactive hazardous wastes react violently under normal conditions, such as coming into contact with water.

Toxicity - toxic hazardous wastes are harmful or deadly when swallowed, inhaled or absorbed through the skin.

Solid Waste is also considered hazardous if it is **listed** on one of three lists developed by the United States Environmental Protection Agency (EPA):

Listed Hazardous Waste

- **Nonspecific Source Wastes**
- **Specific Source Wastes**
- **Commercial Chemical Products**

Nonspecific Source Wastes (40 CFR 261.31) - general wastes, commonly produced by manufacturing and industrial processes (i.e. spent halogenated solvents, dioxin wastes).

Specific Source Wastes (40 CFR 261.32) - wastes from specifically identified industries such as wood processing, petroleum refining, and organic chemical manufacturing (ie. sludges, still bottoms, wastewaters).

Commercial Chemical Products (40 CFR 261.33 (e) and (f)) - specific commercial chemical products, or manufacturing intermediates (ie. chloroform, creosote, sulfuric acid, DDT).

While many wastes have dangerous properties, not all are defined as hazardous. For instance, radioactive and infectious wastes are considered dangerous, but they are not defined as hazardous waste and therefore, are regulated differently than hazardous wastes.

Who Generates Hazardous Waste in Texas?

Large Quantity Generators in Texas (1993)
- Top 20 Generate 76% of Total Hazardous Waste
- Top 200 Generate More Than 99% of Total Hazardous Waste

Texas produces more petrochemical and refined products than any other state. As the national leader in these industries, Texas is also the national leader in the production of hazardous waste. In 1993 more than 11,000 Texas generators reported generating 188 million tons of hazardous waste. The total increased from approximately 64 million tons in 1989 to 188 million tons in 1993 due to the Toxic Characteristic Leachate Procedure (TCLP). TCLP nearly tripled the number of constituents regulated under federal law. In 1991, 99% of all hazardous wastes were generated by industries and businesses in four Standard Industrial Codes (SIC): Chemical Manufacturing; Petroleum Refining; Primary Metals; Electrical and Electronic Machinery and Equipment and Supplies; and Transportation Equipment.

The major source of hazardous waste is the **Large Quantity Generators**, those who generate more than 1,000 kilograms (approximately 2.5 drums) of waste a month.

Large quantity generators range from major petroleum refineries to local machine shops.

Another source of hazardous wastes are the **Small Quantity Generators**. They generate between 1,000 kilograms and 100 kilograms of waste a month and while the quantity of waste generated is less than 1 percent of the total quantity, the sheer numbers of small quantity generators are significant. Examples of small quantity generators include the following:

Examples of Small Quantity Generators		
	• **Auto repair shops**	• **Print shops**
	• **Dry cleaners**	• **Photography shops**
	• **Laboratories**	• **Schools**

Most people believe that hazardous wastes are generated only by industries or businesses--but this is not the case. In normal household activities, hazardous substances are handled every day, such as paints, cleaning solutions and motor oils. Wastes are generated from the use and disposal of these products.

In addition, hazardous wastes can include excess agricultural chemicals and pesticides. There are approximately 156,000 farms in Texas, and it is estimated that many of these farms are permanently storing unusable hazardous pesticides on the shelves of barns, basements and sheds.

What is the Toxic Release Inventory?

The Toxic Release Inventory (TRI) program, established under the Right-to-Know laws (SARA Title III, Section 313), requires that manufacturing facilities report environmental releases of toxic chemicals, as defined by the U.S. EPA. The following are types of TRI releases and transfers:

1. Any release into the air, whether it is fugitive or stack emissions.
2. Any on-site discharge to a water body or receiving stream (including stormwater).
3. Injection of liquid wastes into on-site underground injection wells.
4. Any on-site land disposals, including landfills and surface impoundments.
5. Transfers off-site of wastewater to publicly-owned treatment works.
6. Transfers off-site to facilities for treatment, storage or disposal.
7. Transfers off-site for recycle.
8. Transfers off-site to be burned for energy recovery.

It is important to study both hazardous waste and TRI releases and transfers when planning for pollution prevention.

Who Must Report TRI?

A manufacturing facility is required to report releases of the TRI chemicals (on form R) to EPA and the state government annually if it meets all of the following criteria:

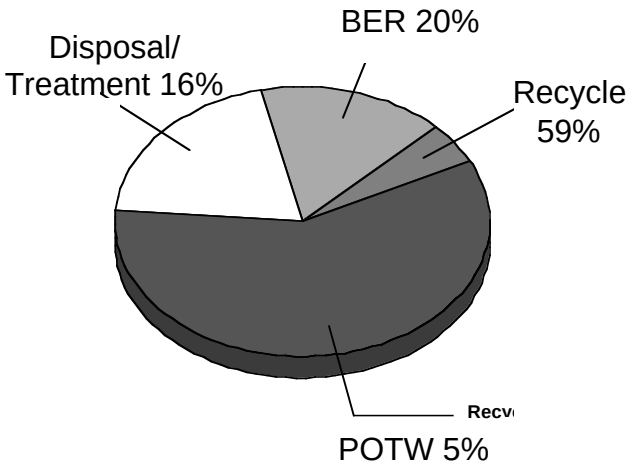
1. It has the equivalent of 10 or more full-time employees.
2. It is included in SIC codes 20 to 39.
3. It produces, imports, or processes more than 25,000 pounds, or otherwise uses more than 10,000 pounds of any of the TRI chemicals.

Starting in the 1996 reporting year, a TRI alternate threshold for facilities with low annual reportable amounts takes effect. This alternate threshold could potentially exempt some facilities from reporting TRI. For more information about the TRI program, please contact the TRI coordinator at the TNRCC (see Appendix F, OPPR brochure).

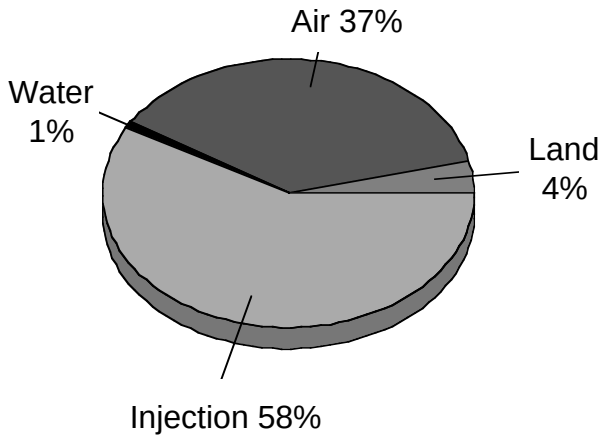
What is the Distribution of TRI Releases?

Approximately 381 million pounds of on-site releases and 420 million pounds of off-site transfers of toxics were reported to TRI in Texas for 1993 by approximately 1200 facilities. The chemical and petroleum industries accounted for approximately 88% of total TRI releases in 1989. Texas ranks second for total releases reported to TRI in 1993.

Texas 1993 TRI Off-site Transfers



Texas 1993 TRI On-site Transfers



POTW: Publicly Owned Treatment Work
BER: Burning for Energy Recovery

What Can Be Done with Pollutants & Contaminants?

Unfortunately, we cannot immediately make pollutants & contaminants go away. During the manufacture of many products used every day, pollutants are produced. Examples from large industries include automobile products (gasoline), plastic packaging, steel girders in buildings, insecticides, and medicines. Small generators also produce pollutants when they provide photo processing services, educational services, dry cleaning services and more.

So, what can be done? The best solution is to generate and release as little as possible, reduce the volume or the hazardous properties, and dispose of the remaining waste safely.

Current Texas state law (Solid Waste Disposal Act) encourages an "order of preference" for methods of treating, storing and disposing of waste. That order is given below:

1. Source Reduction
2. Reuse or Recycling of Waste, or Both
3. Treatment to Destroy Hazardous Characteristics
4. Treatment to Reduce Hazardous Characteristics
5. Underground Injection
6. Land Disposal

This manual focuses on the top categories of the Texas preferred waste management techniques--including Source Reduction, reuse or recycling and some limited forms of treatment. The last chapter in this manual will help you design a Source Reduction and Waste Minimization plan that will aid you in decreasing the amount of hazardous waste your business generates and the amount of toxics you release as well as meet the requirements of the Waste Reduction Policy Act. You should not limit your assessment and plan to hazardous waste and toxic releases. The Texas Natural Resource Conservation Commission encourages facilities to also examine non-hazardous wastes such as cardboard, paper, typewriter ribbons, aluminum cans, etc.

What is Pollution Prevention?

Pollution prevention is not limited to hazardous waste or chemicals subject to TRI reporting, but encompasses any hazardous substance, pollutant or contaminant. There are two types of pollution prevention: Source Reduction and Waste Minimization. Of these two approaches, Source Reduction is always preferred from an environmental perspective.

In general, **Source Reduction** includes any activity that reduces or eliminates the generation of hazardous waste at the source or the release of a pollutant or contaminant, usually within a process. Source Reduction can include product changes which involve:

Source Reduction Product Changes	• **Product Substitution** • **Product Conservation** • **Changes in Product Composition**

Source Reduction can also be accomplished through source control; including input material changes, technology changes and good operating practices.

Source Reduction Source Control

Input Material Changes
- **Purification**
- **Substitution**

Technology Changes
- **Process changes**
- **Equipment, piping, or layout changes**
- **Automation**
- **Operating settings**

Good Operating Practices
- **Procedural changes**
- **Loss prevention**
- **Management practices**
- **Waste stream segregation**
- **Material handling improvements**
- **Production scheduling**

Waste Minimization is defined in the State of Texas as any practice that reduces the environmental or health hazards associated with hazardous wastes, pollutants, or contaminants. For purposes of the SR/WM plan and report, Waste Minimization includes reuse, recycling, neutralization, and detoxification. Note that the federal (EPA) definition of Waste Minimization differs somewhat from this. In federal programs, Waste Minimization is defined as Source Reduction plus recycling.

The goal of this manual is to assist companies in assessing their pollutants and contaminants so that they can organize the most successful pollution prevention program possible. Rules have been written requiring companies to evaluate pollution prevention opportunities but the Texas Natural Resource Conservation Commission encourages companies to go beyond what is required. The Governor and the Texas Natural Resource Conservation Commission now sponsor a new and exciting voluntary statewide environmental campaign called **CLEAN TEXAS 2000.**

CLEAN TEXAS 2000

CLEAN TEXAS 2000 is a voluntary statewide environmental program sponsored by the Governor and the Texas Natural Resource Conservation Commission. The goals of the initiative are to reduce the generation of hazardous wastes and toxic releases by 50% or more by the year 2000 (from 1987 levels), to reduce the amounts of wastes going into landfills by 50% by the year 2000, and to educate all Texans about how they can help preserve and protect the air, land and waters of the state. For more information CLEAN TEXAS 2000, see Appendix C.

Two important components of CLEAN TEXAS 2000 are CLEAN INDUSTRIES 2000 and CLEAN CITIES 2000. Through the CLEAN INDUSTRIES 2000 program, facilities are committing to (1) voluntarily reduce hazardous wastes and/or toxic emissions by 50% by the year 2000; (2) form a citizens' advisory committee; (3) develop internal environmental management systems to ensure high levels of compliance with state and federal law; and (4) to sponsor a community environmental project, such as the Texas Watch citizens' volunteer water quality monitoring program.

Although the goals of both CLEAN TEXAS 2000 and the Waste Reduction Policy Act are pollution prevention, it is important to note that CLEAN TEXAS 2000 is a voluntary program and the Waste Reduction Policy Act is legislatively mandated.

How To Use This Manual

Individual chapters are presented to assist you in preparing a pollution prevention assessment. Each chapter contains worksheets which are preceded by a detailed description explaining the worksheet and offering you advice on how to complete the worksheet. **Because individual company's needs vary, you are encouraged to modify the procedures and worksheets to fit your requirements.** The last chapter includes three possible methods of preparing a pollution prevention plan as required in the rules.

In the next section, we will begin the assessment starting with **planning** and **organizing** your program and setting your program's **goals**.

2

Planning, Organization and Goals

Introduction

Your pollution prevention program will affect many groups within your company, such as production, financial, and marketing. This section presents a process for bringing these groups together to:

1. Develop a Company Environmental Policy,
2. Organize a Pollution Prevention Program, and
3. Set Pollution Prevention Goals.

Develop a Company Environmental Policy

Your pollution prevention program will succeed only if your management supports it. In order for them to understand what they are supporting, it may be necessary for you to draft a "Corporate Environmental Policy or Mission Statement" that states the programs objectives.

Beyond informing your management of the program's objectives, the policy is also their (senior management's) formal commitment to proceed with the implementation of your program. With your senior management's understanding and formal commitment you will likely find it easier to implement pollution prevention procedures.

Organize a Pollution Prevention Program

If your company has established its Environmental Policy, you can use the policy guidelines to help establish a pollution prevention program. Your program may include educational, incentive, and waste assessment components. **This manual's focus is on organizing the waste assessment component.**

Because your pollution prevention program will affect a number of groups you should consider assembling a task force whose primary functions will be to:

1. Establish the source reduction/waste minimization plan, including development of measurable goals which are consistent with the policy adopted by management.

2. Implement the source reduction/waste minimization plan.
3. Monitor the implementation of the plan versus the goals.

The size of this group will depend on your company's size; however, the group should include members of any department that has a significant interest in the outcome of the program. One of the keys to a successful task force is a powerful leader who is committed to pollution prevention. This individual should work closely with the decision makers in the company and be persuasive in order to sell pollution prevention to upper level management, as well as employees.

Set Pollution Prevention Goals

The first priority of the pollution prevention program task force is to establish goals that are consistent with the company environmental policy. Goals should be both long and short term. The short term goals are the incremental goals that lead up to an overall long term goal for the facility. The goals should also address source reduction and waste minimization activities.

Pollution prevention goals can be both qualitative and quantitative. Examples of qualitative goals include "a significant reduction of hazardous waste emissions into the environment," or "incorporation of pollution prevention practices into everyday activities at the plant." Examples of quantitative goals include "a 50% reduction in total hazardous waste (excluding wastewater) from the year 1987 to the year 1997," or "a decrease by 200 tons of reportable TRI releases and transfers from 1990 to 2000." It is very important to set quantitative goals, as the progress of these can be measured. In this regard, a facility will be able to clearly show success in achieving their goals.

The goals of the program should be reviewed periodically in light of changes in technology, raw materials, regulations, economics, and corporate policy.

Notes

Worksheet 1
Corporate Environmental Policy

Worksheet 1 contains an example of a formal Corporate Environmental Policy statement. It is likely the example will need to be adapted to meet the specific needs of your company.

Because a successful hazardous waste reduction program requires corporate commitment, it is recommended that the policy you draft contain three items:

First, the policy should be signed by a senior officer of your corporation, preferably the Chief Executive Officer (CEO). The CEO's signature indicates that the policy is fully supported by all of your company's management and not solely by you (or your office).

Second, the policy should contain a clear statement that it is company policy to reduce hazardous waste and releases of pollutants and contaminants to the environment. Based on this commitment, you will build your company's pollution prevention program.

Third, the policy should give you and your management initial direction (guidelines) for your pollution prevention program. In the example two directions are given:

1. Every employee is made responsible for environmental protection. This could indicate you will start an education program to make each employee aware of, and responsible for, environmental protection and pollution prevention.

2. Pollution prevention techniques will be considered before decisions are made to dispose of hazardous waste (landfill, inject, treat). This could indicate you will start a pollution prevention assessment program within your company.

The environmental policy should be explained to all employees so they can actively help you with your pollution prevention program. When the policy is presented (ie. published in the company paper, posted, etc.) you may wish to initiate an incentive program (similar to a safety award program) that seeks employees' ideas on pollution prevention techniques specific to their work areas.

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Worksheet 1

Corporate Environmental Policy

TNRCC

Example – Corporate Environmental Policy

(YOUR COMPANY).....is committed to continued excellence, leadership, and stewardship in protecting the environment. Environmental protection is a primary management responsibility, as well as the responsibility of every employee.

In keeping with this policy, our objective as a company is to reduce waste and achieve minimal adverse impact on air, water, and land through excellence in environmental control.

Our Environmental Guidelines include the following:

Environmental protection is a line responsibility and an important measure of employee performance. In addition, every employee is responsible for environmental protection in the same manner he or she is for safety.

Reducing or eliminating the generation of waste has been and continues to be a prime consideration in research, process design, and operations; and is viewed by management like safety, yield, and loss prevention.

Source Reduction/Waste Minimization (reuse and recycling) of materials has been and will continue to be given first consideration prior to classification and disposal of waste.

_____

Chief Executive Officer

Worksheet 2
Program Task Force

A **PROGRAM TASK FORCE** worksheet should be prepared for your pollution prevention program. **Worksheet 2** will contain the names and functions of the members of your task force. Members should include people from departments that have a significant interest in the program. In a large company this may include many people (i.e., engineers, accountants, lawyers, marketers, etc.) while in a small company only two or three people may be involved.

In selecting your members you should understand the **primary responsibilities** of your task force will likely include:

1. Establish the pollution prevention goals,
2. Establish a waste tracking system,
3. Prioritize waste streams for assessments,
4. Select assessment teams,
5. Supervise waste assessments,
6. Select and justify feasible options (based on economic and technical factors),
7. Obtain funding and implement options,
8. Monitor implementation,
9. Monitor performance of the option (waste volume and economic savings),
10. Promote pollution prevention within the company.

You will want to select people who can offer you help in these areas.

Three unique functions you might need to fill are:

Program Manager – If you are in charge of developing the pollution prevention program, you are the program manager. As program manager you are responsible for all components of the program including Pollution Prevention Assessments. A pollution prevention assessment is a structured analysis of a company's opportunities to reduce, recycle, and minimize their waste and is discussed in detail in Chapter 3. To assist you in making these assessments, it is likely you will want to appoint Area Coordinators and/or Assessment Team Coordinators.

Area Coordinators – Does your company have more than one site? If so, break your responsibilities up into site specific tasks, and enlist the help of a coordinator at each site.

Assessment Team Leaders – Assessment Team Leaders will be responsible for coordinating all activities concerning a specific pollution prevention project. (ie. a proposed new piece of equipment, or a proposed new procedure). This person will bring together all aspects of the assessment including waste audits, developing options, engineering, costs, and financial evaluations.

Organization Chart – A sketch of the organization of your task force may be of use in presenting the members of your task force to senior management, and other employees.

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Worksheet 2

Program Task Force

TNRCC

Function	Name	Location	Telephone #
Program Manager			

Organization Chart (sketch)

Worksheet 3
Pollution Prevention Goals

Separate goals should be set for both Source Reduction and Waste Minimization efforts at the facility including incremental goals to aid in evaluating progress. The company's plan should also explain the overall goals and incremental goals for the entire facility. If the company is interested in the Clean Texas 2000, Industry Honor Roll (see Appendix C) you should consult the requirements of this program before setting your goals.

When setting goals, it may help to keep the attributes of effective goals in mind.

Attributes of Effective Goals

- *Acceptable* to those who will work to achieve them.
- *Flexible* and adaptable to changing requirements.
- *Measurable* over time.
- *Motivational.*
- *Suitable* to the overall corporate goals and mission.
- *Understandable.*
- *Achievable* with a practical level of effort.

Source: Pearce and Robinson, *Strategic Management* (1985)

Examples of effective pollution prevention goals are given below.

Example of Pollution Prevention Goals

- **Reduce hazardous waste generation 65% from 1987 levels.**
- **Reduce manufacturing emissions by 90% by the year 2000, from 1990 levels.**
- **Reduce the costs of waste management.**
- **Reduce the risk to human health and environment.**
- **Provide incentives for waste reduction projects.**
- **Provide recognition for those who excel in waste reduction.**
- **Achieve 50% reduction in emissions of CFC's by 1991 and 100% by 1994, (based on 1987 levels)**
- **Eliminate toxic air emissions of all types by the year 2000.**
- **Decrease the total manufacturing process waste disposed by 25% between 1990 and 1995.**
- **Increase the recycling of paper 35% between 1990 and the year 2000.**
- **Decrease use of paper by 15% between 1995 and 1998.**

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Worksheet 3

Pollution Prevention Goals

TNRCC

Pollution Prevention Goals

Worksheet 4
Employee Training Program

Training is critical to the success of a company's pollution prevention program. The training program can set the stage for how employees preceive and, thus, implement pollution prevention within the company. Companies should set goals to direct the efforts of all employees toward pollution prevention, regardless of the level of knowledge or experience in the environmental area. The exact type of training program will vary depending o factors such as the type of company, the size of the company, and the knowledge and experience of the employees.

The training program can be utilized as both an educational and motivational tool. All employees should be educated on the benefits of pollution prevention, as well as the copany's mission statement with regards to pollution prevention. However, diferent levels of technical training may be appropriate for different staff responsibilities. For instance, a fifteen minute training course offered four times a year on recycling cans, paper, typewriter cartridges etc. may be appropriate for everyone at the facility especially secretarial staff. However, a one day course on pollution prevention may be more appropriate for environmental management staff. A three hour course on pollution prevention opportunities and cost savings may need to be developed for accounting or purchasing staff.

Worksheet 4, “Employee Training Program”, includes a checklist of important employee training areas. If a company does not have a program in place, now (before the assessment begins) is a good time to start. As previously mentioned, the course should be geared for the needs of your company. Regardless of the approach taken, however all training programs should include the information on the accompanying worksheet (you should be able to check “yes” on all five questions).

The last line on the worksheet provides space for any additional comments or explanations of the employee training program.

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Worksheet 4

Employee Training Program

TNRCC

Checklist Questions:	yes/no
1. Do you have a pollution prevention training program in place at this time?	
2. Is the training program open to all employees?	
3. Do key personel require additional training or in-depth training?	
4. Have all employees on the task force completed the training program?	
5. Does the training course include information on pollution prevention definitions and laws?	

Comments or further explanation of the training program.

3

Pollution Prevention Assessment

Introduction

A pollution prevention assessment is a structured analysis of a companies opportunities to reduce, recycle, and minimize their waste. The results of the assessment can be used for planning and allocating resources for pollution prevention projects, as well as setting the 'baseline' for measuring future pollution prevention progress. All facilities generating hazardous waste or releasing or transferring toxic chemicals can benefit from an assessment. The level of detail and exact approach each facility takes in performing the assessment will be dependent on many factors, such as the size of the company or the number of waste streams.

This chapter contains information on how to perform an assessment. Worksheets are included to provide assistance and make the assessment task easier. Many of these worksheets can also be used to document the assessment phase of a Source Reduction and Waste Minimization plan as required under SB1099.

Each of the subject areas, listed below, are covered **in this chapter.** Some of these areas include an accompanying worksheet, others only require research or thought. The subjects covered in this chapter are as follows:

1) Selecting a team to perform the assessment.

2) Developing an overview of all the waste generated (or released/transferred).

3) Assessing the risk to human health and the environment associated with each waste stream or release/transfer.

4) Performing a site inspection.

5) Prioritizing waste stream (or release/transfers) to be targeted for pollution prevention projects.

6) Developing options for Source Reduction an/or Waste Minimization projects for those waste streams (or release/transfers) targeted for pollution prevention.

Once the initial assessment is complete, the facility should have a list of pollution prevention options for selected waste streams. Potential projects can be then evaluated and selected based on more detailed economic and technical considerations. This next step is described in Chapter 4, Feasibility Analysis and Project Prioritization.

Worksheet 5
Assessment Team Make-Up

The specific make-up and number of members will vary depending on the size, complexity, and resources of the company. Generally it is best for the task force to select people in the company who will be affected by the assessment as well as those who can contribute to the assessment. Personnel from the following areas should be considered when developing the assessment team.

- Site coordination
- Operations
- Engineering
- Maintenance
- Scheduling
- Procurement
- Accounting
- Safety
- Legal
- Facilities
- Materials control
- Shipping/receiving
- Environmental control
- Research and development
- Management
- Quality control
- Personnel

In a small business, the assessment team may be limited to one or two individuals responsible for the facility operations. Each team should include people with direct responsibility and knowledge of the particular waste streams or areas of the plant. A team leader should be chosen who is familiar with the facility, the people, and the processes. **It is also very important for the team leader to have the desire to make changes to reduce and eliminate waste and releases.**

In addition to the internal staff, a business may want to consider hiring a consultant, especially in the assessment and implementation (next chapter) phases. Outside consultants can bring a wide variety of experience and expertise to a pollution prevention assessment.

On **Worksheet 5**, fill in the information on the assessment leader and the team members.

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Worksheet 5

Assessment Team Make-Up

TNRCC

Function/Department	Name	Telephone	Duties
Assessment Team Leader			
Assessment Team			

Organization Chart (sketch)

Worksheet 6
Process & Waste Stream or Release Data

One of the keys to a successful pollution prevention program is a good tracking system of wastes and releases from cradle to grave. Some companies have implemented a bar coding system to follow specific chemicals and/or waste streams throughout their life at the facility. The pollution prevention battle is almost won when a company knows the quantity and location of their chemicals/waste streams or releases.

Information about waste streams can come from a variety of sources. Some information is available from completed hazardous waste manifests, which includes the description and quantity of hazardous waste shipped. Other sources of information include biennial reports, Toxic Release Inventories (Form R), Annual Waste Summaries, TWC Notice of Registration, and National Pollutant Discharge Elimination System (NPDES) monitoring reports. The NPDES reports include the volume and constituents of wastewater discharges.

Each process or waste stream should be identified separately on Worksheet 6 (make extra copies of Worksheet 6). Use a separate worksheet for each waste stream or release. This worksheet lists several important documents that provide valuable information on the plant. A process flow chart, if available, is useful in almost every case. **Beside each of the listed documents indicate, with a checkmark, whether the document is available or not and if it is current (up-to-date).** There is also a space to include the location of the document (e.g. accounting office, plant managers files, etc.)

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Worksheet 6

Process & Waste Stream or Release Data

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Document	Available	Current	Location
Process Flow Diagram			
Material Balance			
Flow/Amount Measurements			
Stream #			
Stream Analyses			
Stream #			
Input Materials to Process			
Shipping/Receiving Inventory			
Process Description			
Operating Manuals			
Equipment List			
Equipment Specification			
Piping & Instrument Diagrams			
Hazardous Waste Manifest			
Work Flow Diagrams			
Material Safety Data Sheets			
Production Schedules			
Form R			
Title II Forms			
Annual Waste Summary			
Environmental Audit Reports			
Batch Sheets			
Permit/Permit Applications			
Notice of Registration			

Worksheet 7
Waste Stream/Release Summary

The "Waste Stream/Release Summary" worksheet summarizes the most important information gathered from the documents identified in Worksheet 6. This worksheet can assist the assessment team in evaluating each waste stream/release and comparing them to one another before the onsite inspection. This will later help the assessment team set priorities for the waste streams/release and processes at the facility.

Not only is this worksheet valuable for the assessment team but it can also provide the company with documented proof of pollution prevention assessment efforts for each waste stream/release. The items listed below will help answer the questions on **Worksheet 7**. **It is important to report quantities consistently using the same unit of measure (e.g. pounds per year, tonnage per year, etc.).**

1. Process/operation refers to the type of process or operation (eg. batch, continuous, semi-batch, etc.)

2. Include the identification number (federal and state) and name of the waste/release.

3. The source/origin of the waste/release refers to the point of waste generation or release.

4. Include a list of all chemicals and amounts found in each waste stream/release. Also include a list of all hazardous characteristics found in the waste streams.

5. Record the amount of waste generated or toxic released for a period of time (e.g. pounds per year).

*6. The annual consumption rate refers to the amount of input materials required, in a given year, for production in a process.

*7. The annual production rate refers to the amount of product produced in a given year.

8. The cost of disposal includes the unit cost and the overall cost.

9. A few examples of the method of waste management/disposal are as follows:

   - Sanitary landfill
   - Hazardous waste landfill
   - Onsite recycling
   - Incineration
   - Combustion with heat recovery
   - Distillation
   - Dewatering
   - Deep-well injection
   - Surface water discharges
   - Transfers to POTW
   - Air releases

* Optional for throughput calculation.

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Worksheet 7

Waste Stream or Toxic Release Summary

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Descriptions

1. Process/Operation

2. Waste/Release Name

3. Source/Origin

4. Component/Attribute of Concern

5. Amount of Waste Generated or Toxic Released

*6. Consumption Rate (Input)

*7. Production Rate (Output)

8. Cost of Disposal (Waste)

9. Method of Management

* Optional for throughput calculation.

Avenues of Waste and How to Eliminate Them

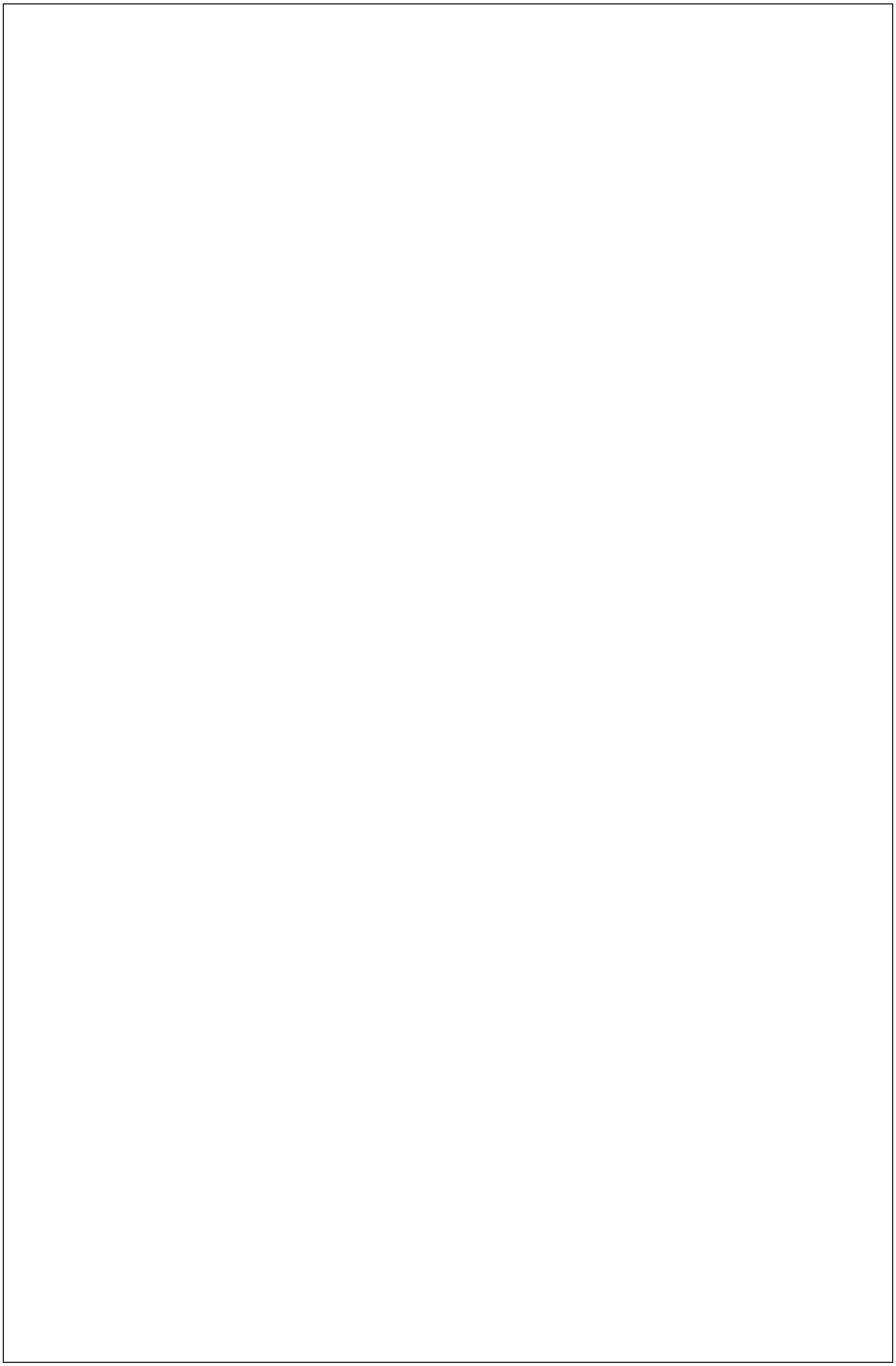
Waste may occur at any point in a facility. It is important during the site inspection and as the material balance is being prepared to look at all possible avenues of waste. As the waste assessment team looks at "The Avenues of Waste" figure, they should imagine the complete system at their facility. This exercise should enable them to spot potential waste throughout the production process as they tour the facility.

This figure is separated into three parts. First is the "input" area where the input materials are stored. Obvious wastes include leaks and spills from containers and contamination from contact with other chemicals. Not so obvious, but equally important avenues of waste, are input materials with expired shelf life and spoiled materials. If the shelf life has expired for certain materials, or materials have spoiled, they should be properly disposed of and a better inventory system should be incorporated.

The second part, locating waste in the "process", will probably require more time and effort than was expended in the "input" part. Waste generated from the process areas occurs due to process inefficiencies, which can be caused by both equipment and personnel. Although most equipment today is designed to run at the highest efficiency to generate the least amount of waste, the equipment's level of efficiency can still be variable. Waste will also continue to exit a facility if proper control is not maintained by operation personnel. All waste arrows on this figure can be reduced or eliminated by operation practices or equipment changes.

The third part is the "product" stage, where storing and shipping take place. Waste can still be generated at this stage through improper handling of products and poor inventory control. Shipping also generates waste since shipping vehicles require maintenance, which means waste tires, used oils and grease, antifreeze, parts and wash bays sludges are created.

The "avenues of waste" chart was composed from a fictional facility to demonstrate some of the waste streams that are generated to make a product. The purpose was to give an overview from the beginning to the end of a process to show how some waste streams are generated. Once this is understood, the assessors can use the "Big Picture" concept of the waste streams to address each waste stream at their facility and develop options that will reduce or eliminate the waste.



Site Inspection

The next two steps in the assessment do not require worksheets. They are encouraged, however, because they are essential for a general understanding of the plant and for the steps that follow in the assessment.

After collecting and examining all the data, the next step is for the assessment team to inspect the site. To perform the most efficient inspection, all team members should review the processes beforehand; that way the members can evaluate the various processes and ask pertinent questions. **Talking to and asking questions of employees is important and will probably reveal valuable information.** Since the employees work closely with the equipment and processes at the facility, they know where many of the inefficiencies are and may know how to correct them.

The inspection should cover a full array of process flows and areas of operation at the plant including the following steps:

- Shipping and receiving areas
- Raw material storage areas
- Unit processes and product/by-product areas
- Waste generation points
- Waste storage area

The site inspection can simply be a walk-through of the plant to gain a better understanding of pollution prevention opportunities. However, it may also be useful to take detailed notes and photographs of particular areas. The photographs can then be used for discussions with management regarding potential pollution prevention projects. Photographs can then be taken again after improvements have been made and used to show progress. For example, one could photograph what's contained in garbage cans or storage areas in order to obtain a visual ‘baseline’ of the plant. This visual record can be used to identify needs for better housekeeping or opportunities for recycling specific materials. Once the improved procedures are implemented, photographs can be taken again to show what progress has been achieved. This can be an effective tool for demonstrating progress to management, promoting pollution prevention within the facility, and giving recognition to employees who have participated in the projects.

The first step in the inspection takes place in the **shipping and receiving areas**, where documents should be in order, and arriving materials should be appropriately handled and immediately sent to their destination. The purchasing and receiving end of a business can offer many opportunities to reduce waste and save money. For example, ensuring that materials are only ordered in the quantities needed will reduce the amount of unused materials that goes to waste.

The inspection should next examine the **raw material storage areas** for stock control processes. Stock that has outlived its shelf life is a common problem in small companies and should be corrected. Storage areas should also be examined to ensure that they are meeting all safety requirements.

The inspection of the **process area**, including the product and by-product areas, is important because it provides the members with the opportunity to familiarize themselves with these areas. This knowledge will later help complete the other steps in the assessment.

Waste generation points should be examined carefully to be sure that good housekeeping is being followed, that hazardous and non-hazardous wastes are being segregated, and that products are not being overused or misused (e.g. that employees are not using two gallons of solvent when one will do, that rinse hoses are off when not in use, etc.). Finally, the **waste storage area(s)** should be inspected for proper storage procedures, leaking drums, proper labelling, etc. Also, based on the quantity of materials contained in the storage area and the frequency of pick-up, initial rough estimates of waste disposal costs can be obtained.

Material Balance Approach

Once the inspection is completed, by all members of the team, an approach should be taken to analyze the waste streams and their processes. One method is called the material balance approach. This approach utilizes data from the process and waste stream worksheets (6&7) and information from the site inspection.

According to the material balance approach, the weight of all materials entering the process must equal the weight of all the materials leaving the process. When the final product comes out weighing less than the amount of materials that went in, the difference is the amount of waste. Locating the reduction possibilities for this waste is the goal of the assessment.

To incorporate the material balance approach each unit process should be examined, and a process flow diagram should be prepared for each process at the plant. Then **all the inputs** for each unit process should be identified. Inputs include raw materials (including their containers), waste that is reused and process water.

The next step is to identify all of the outputs of the unit processes. This includes products, by-products, wastes to be recycled and wastes to be disposed. Sources of information on outputs include bar codes, shipping records, billings for solid waste disposal and municipal water treatment, hazardous waste manifest, Material Safety Data Sheets (MSDS), annual pollution reporting forms, plant flow sheets, and environmental permits.

After all input and output data has been collected, the process itself should be tracked using a flow chart. In this way the waste can be tracked and waste losses discovered. Depending on the way the waste is lost, how much is lost and other factors, the process may be changed and improved if possible.

Obtaining an overall picture of the plant's operation and its weaknesses (if any) will help the assessor(s) determine the areas with the most potential for pollution prevention.

Worksheet 8
Assessment of Risk to Human Health & the Environment

Worksheet 8 will enable the assessment team to consider the potential risks to human health and the environment under current operational procedures.

Examination of risk at a facility is difficult because risk depends on operational procedures and precautions taken (or not taken) at the facility. Since operational procedures are difficult to measure, we must use other methods to assess the risk potential for human health and the environment. This worksheet contains questions to better asses the potential for risk. Depending on the recorded information for each of the questions, each issue should have one "Level of Risk", either high, medium or low. Of course this determination is subject to the individual judgement of the assessment team (who should know the facility and processes better than anyone else); however, the information will help others (if they so desire) to make their own decision about the level of risk associated with each waste stream/release.

In order to obtain information to answer the questions in issue numbers 1. ''Compound characteristics" and 2. ''Health hazards", the *NIOSH Pocket Guide to Chemical Hazards* is recommended. This pocket guide is available through the U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. The questions in issues 1 and 2 can also be answered using *Dangerous Properties of Industrial Materials* by N. Irving Sax and Richard J. Lewis, Sr. One other possible source is the Material Safety Data Sheets (MSDS) which accompany all chemicals and is required by law.
Issue number 3. "Environmental hazards" addresses ways in which the environment is or could be exposed to compounds in the waste stream, and the potential risks associated with this exposure.

In assessing environmental hazards, the pathway of exposure must be considered. For example, what is the proximity of a waste stream to waterways, schools, parks, residences, etc. The waste may also enter an exposure pathway such as a release to air. This information should be recorded as it helps evaluate the overall risk at the facility.

Another important environmental hazard to consider is the health of wildlife and plants near the facility. It is important for someone at the facility to observe and be aware of the health of wildlife and plants near the facility at all times. This study will be especially important if a decline or increase in population is noted.

While the answers to these questions may not be a direct indication of the level of risk, they can provide some meaningful data on the potential for risk. Because this worksheet does not necessarily reveal the actual level of risk, additional space is added to explain why, or how the recorded "Level of Risk" was determined. Appendix D is included for those who choose to do a more detailed risk assessment.

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Worksheet 8

Assessment of Risk

TNRCC

Waste Stream or Release:

Questions:	Level of Risk (High, Med, Low)
1. Compound (or chemical) characteristics: a. Chemical name: _____ b. Exposure limits: _____ c. IDLH (Immediately Dangerous to Life or Health) level: _____ d. Chemical and physical properties: _____ _____	
2. Health hazards: a. Route of health hazard (inhalation, skin absorption, ingestion, and skin or eye contact): _____ b. Symptoms: _____ _____ c. Target organs: _____ d. Level of toxicity: _____ e. Known carcinogen?: _____	

Questions:	Level of Risk (High, Med, Low)
3. Environmental hazards: a. Type of exposure (air, land, or water): _____ b. Exposure routes (incinerator, surface containers, underground tanks, underground injection wells, etc.): _____ c. Observation of wildlife (mammals, birds, fish, etc.) and plant health near the facility. _____ d. Proximity (miles, feet) to the following: School _____ Day care center _____ Residences _____ Church _____ Park _____ Restaurants _____ Other _____ e. Proximity (miles, feet) to waterways (ponds, wells, springs, rivers, etc.). _____ f. Provide schematic of facility and the surrounding area below.	

Comments About Risk Assessment:

Worksheet 9
Waste Stream or Release Prioritization

Ideally **all** waste streams and plant operations should be assessed for pollution prevention; however, this is not always possible. In order to assist in the examination of the waste streams it is necessary to prioritize the waste streams/releases. **Prioritization should be based on factors listed on Worksheet 9 (additional copies should be made for each waste stream).**

The questions listed on the worksheet should be assessed in the following two ways. First, the **relative weight (W)** should be assessed on a plant-wide basis, according to each of the 7 or more criteria. The relative weight should be between 1 and 10 (1, least important, to 10, most important). The weight will depend on company goals, pollution prevention goals, etc. **Since the weight reflects company policy, the relative weights will remain constant on all the waste stream/release sheets.**

The **rating (R)** represents a waste stream or release's rank which will vary from one waste stream/release to the next. The rank for each criteria will reflect the need for waste reduction. The rating, similar to the relative weight (W), should also be done on a scale of 1 to 10. The relative weights (W) should be multiplied by each rating (R) to fill in column (RxW). Then add the (RxW) columns to calculate the sum of priority ratings. Comparing the waste stream sheets with one another will enable the team to give each stream a priority rank.

Below are some questions to ask when filling out the worksheet. Extra space has been provided for additional questions if the assessment team feels they are needed.

1. How high or low is the current disposal cost, and if determinable, how high or low will future costs go?
2. Examine the current environmental regulations (federal, state, and local), and potential future laws. Do these laws inhibit current processes for a waste stream or are they likely to in the future?
3. Are the raw material costs high, or might they increase to an unacceptable level sometime in the future?
4. Does the waste pose a direct, immediate, or perceived risk to the workers, the public, or the environment?
5. Does a waste create complex problems for processing, handling, storing, and discharging?
6. How much volume is generated or released, and will future capacity issues be a problem?
7. How long will the chemical (compound) continue to display its hazardous characteristics? (What is the residual life-time?)
8. Other areas of concern.

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Worksheet 9

Waste Stream Prioritization

TNRCC

Waste Stream ID:

Priority Rating Criteria	Relative Weight (W) Plant-wide	Rating (R) Plant-wide	RxW
1. Cost of Disposal			
2. Environmental Regulations			
3. Raw Material Cost			
4. Threat to Workers, Public, and Environment			
5. Processing Problems			
6. Amount of waste generated			
7. Residual lifetime			
8. Other areas of concern			
Sum of Priority Ratings SUM (RxW)			
Priority Rank			

Source Reduction Options

After opportunities for waste reduction have been identified by the waste assessment team, a list of Source Reduction options should be developed (see chapter 2 for Source Reduction definition). **Plants and waste streams vary, so it is important to find the option best suited for the plant's particular needs.** In some cases the large amount of research necessary to choose an option may require outside expertise.

Source reduction options include technological and material changes as well as changes in procedure and organization. Since the technological and material changes would vary a great deal depending on the type of operation, they are not covered in this manual. The next section, "Information on Source Reduction", includes a list of resources that will also help companies find more Source Reduction options.

The **procedural and organizational activities listed below** should be followed by all companies. Accompanying each of these activities are some examples.

- **Inventory control/material and waste tracking** – labeling all containers, using computerized monitoring, using Material Safety Data sheets (MSDSs).
- **Improved scheduling** – scheduling of batches to reduce the need for cleaning.
- **Recordkeeping** – good documentation of process procedures, control parameters, etc. to be included in an operator manuals, or other documents.
- **Preventive maintenance** – regular inspections and corrective maintenance rather than "waiting till it breaks down".
- **Spill/leak prevention** – precautionary modifications to equipment and containment areas, performance of hazards analyses, and development of a Spill Response Plan.
- **Material usage, handling, and storage** – standardizing materials (paints, solvents, waste oils), spacing containers, labeling containers, separating hazardous substances, and careful stacking.
- **Employee education** – training in proper operating procedures, and regular drills for emergency situations.

Recycling Options

The goal of recycling is to recover or reclaim unused material. Generated material can be recovered either on-site or off-site, depending on the quantity of waste generated, the capital and operating costs, and availability of in-house expertise.

Another alternative to on-site recycling is the use of waste exchanges which aid in the transfer of wastes from the generator to another company. Companies interested in waste exchanges can do so through the TNRCC **RENEW (the Resource Exchange Network for Eliminating Waste)** program. The RENEW program helps bring together waste generators and potential users who both can market their hazardous and non-hazardous wastes confidentially in the RENEW catalog. The catalog is published quarterly and sent to over 4,000 subscribers. For more information about the RENEW program and to receive a catalog write to

RENEW, MC 112, Texas Natural Resource Conservation Commission, P.O. Box 13087, Austin, TX 78711-3087.

As is the case for Source Reduction options, examining recycling options may and probably will require substantial outside research. **Each facility's processes and waste streams are unique and require a large amount of knowledge in order to make an educated decision regarding recycling options.**

Information On Source Reduction and Recycling Options

Sources of information for Source Reduction and recycling options include:

- **Plant engineers and operators** – The employee(s) that are intimately familiar with a facility's operation are often the best source of suggestions for potential pollution prevention options.

- **Trade association** – As part of their overall function to assist companies within their industry, trade associations generally provide assistance and information about environmental regulations and various available techniques for complying with these regulations.

- **Published literature** – Technical magazines, trade journals, government reports, and research briefs often contain useful pollution prevention information. See Appendix E for information regarding TNRCC and EPA guidance documents.

- **State and local environmental agencies** – The TNRCC's Office of Pollution Prevention and Recycling offers many programs to help businesses and industries with pollution prevention including technical guidance documents, small business assistance, site visits, and workshops. See Appendix F for a directory of The Office of Pollution Prevention and Recycling.

- **Equipment vendors** – Equipment vendors and other service companies are excellent sources for identifying potential equipment-oriented options. Vendors are eager to assist companies in implementing projects and in some cases set up bench scale test programs.

- **The Environmental Protection Agency (EPA)** – The EPA provides many services to help businesses with pollution prevention including clearinghouses, databases, bulletin boards, periodicals and directors, and hotlines. An overview of EPA offerings can be obtained by ordering the **Pollution Prevention Directory (EPA/742/B-94/005)** from EPA's Pollution Prevention Information Clearinghouse (PPIC) at 202-260-1023. In addition, some of the EPA's industry specific documents are listed (with ordering information) in Appendix E of this manual.

- **Gulf Coast Hazardous Substance Research Center (GCHSRC)** – The GCHSRC, at Lamar University, coordinates the activities of a consortium of eight universities to concentrate in the areas of Source Reduction/Waste Minimization and alternate technology development. (409)880-8768.

Worksheet 10
Options Description

The **first section of worksheet 10** provides space to record the possible Source Reduction or recycling option, and a concise description of this option. **Estimating the amount of waste reduction is a requirement of Senate Bill 1099. Chapter 6 provides more detail on meeting this requirement.** The estimated waste reduction should specify the amount reduced and the time span involved.

The **second section** includes an area to indicate the **type of option described; whether it involves Source Reduction or recycling**. This section is also necessary to meet the requirements of Senate Bill 1099.

In the **last section**, the person responsible for the option proposal and the reviewers' names should be recorded in case management needs this information later to answer further questions about the option. Finally, the decision to approve study of the option, and the reason for accepting or rejecting the option proposal should be recorded. This explanation is extremely important and should be as explicit as possible.

Note: This worksheet could also be used for an "Employee Suggestion Sheet".

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Worksheet 10

Option Description

TNRCC

Option Name:

Briefly describe the option _____

_____

_____

_____

_____

Waste Stream(s) Affected: _____

Input Material(s) Affected: _____

Product(s) Affected: _____

Estimated Waste reduction: _____

Indicate Type:

❒ **Source Reduction** ❒ **Recycling/Reuse** ❒ **Onsite** ❒ **Offsite**

- ❒ Equipment-Related Change
- ❒ Personnel/Procedure-Related Change
- ❒ Materials-Related Change
- ❒ Other _____

- ❒ Material reused for its original purpose
- ❒ Material recycled
- ❒ Material sold
- ❒ Other _____

Originally proposed by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved for study: ❒ yes ❒ no by: _____

Reason for Acceptance or Rejection _____

_____

_____

_____

Worksheet 11
Treatment Feasibility

Treatment of waste ranks third below Source Reduction and recycling in the state hierarchy of waste management. If no Source Reduction or reuse/recycling option is viable then treatment should be considered as an option before underground injection or disposal. In addition, RCRA hazardous waste eventually will be severely restricted from all land disposal by federal rules and statute. For further information on the land disposal restrictions see 40 CFR Part 268.

Generators have the option of treating their own hazardous waste without a permit under certain conditions:

- Treatment takes place within a container or tank;
- Waste must be treated within 90-180 (or 270) days depending on waste generation category;
- Containers must meet RCRA regulations; and
- Accident prevention plans must be prepared and followed.

If the business does not meet each of these requirements and treats hazardous wastes on-site, it must obtain a RCRA hazardous waste treatment permit. A business **may not dispose** of its hazardous waste on-site unless it has obtained a RCRA Treatment, Storage, and/or Disposal Facility (TSDF) permit. Obtaining a permit is a stringent, costly and time consuming process. Permitting standards are described in 30 TAC Chapter 335, Subchapter F.

If a business has determined that its wastes are not a “hazardous waste” as defined by the EPA or the State, it should still take steps to ensure that it is complying with all applicable EPA and State requirements for disposal of nonhazardous waste. It should make all reasonable efforts to ensure that nonhazardous wastes are handled in a way that prevents uncontrolled release to the environment and the potential future liabilities associated with such releases. A waste can be classified as nonhazardous and still contain some hazardous chemicals or have the potential to cause harm to human health or the environment if **improperly** treated, stored, or disposed.

Worksheet #11 provides a list of questions to help evaluate treatment feasibility. The last part of this worksheet includes space for final comments about the technical feasibility of the treatment options under consideration. This should help in justifying or explaining the treatment option selection. Comments may include especially detrimental or beneficial results of the option .

Note: Some forms of treatment may not count toward Waste Minimization; they are however, still preferred by the TWC over injection and land disposal.

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Worksheet 11

Treatment Feasibility

TNRCC

Option: _____

Questions:

1. What is the best available method to treat the waste?

   a. Treatment to destroy the hazard

   b. Treatment to reduce the hazard

   c. Neutralization

   d. Bioremediation

   e. Vitrification

2. What type of containment system will be used for treatment?

3. Will the containment system meet RCRA regulations?

4. How long will waste be stored before treatment?

Comments:

4

Feasibility Analysis and Project Prioritization

Introduction

In the last part of the previous chapter pollution prevention options should have been selected for closer review. **Each Source Reduction recycling, or treatment option should now be examined in more detail using the feasibility analysis which will evaluate each option according to its technical and economic feasibility.** After this has been accomplished each suggested project will be prioritized using worksheet 14, "Waste Reduction Project Prioritization".

The technical evaluation examines each option to consider whether or not it could be incorporated into current operational procedures. Process changes may need to be tested, or at least researched. Vendor consultants, who have experience in technical process changes, can provide valuable assistance in this area. There are many important considerations involved in this step; some key ones are listed on worksheet 10, "Technical Feasibility".

If an option passes the technical evaluation it should next be evaluated economically. **The economic evaluation involves profitability analysis,** which uses the following methods as measures of profitability: 1) the payback period and 2) the return on investment. These methods are then used to prepare the capital costs and the incremental operating costs. Worksheets have been included to aid the task force on this evaluation.

The final step in the feasibility analysis is prioritizing the waste reduction projects. After completing this worksheet all projects should have a priority rank which will in turn enable the task force to choose the order of pollution prevention projects to be undertaken.

Worksheet 12
Technical Feasibility

The first step in the technical feasibility is to correctly define the problem. Many of the solutions to waste generation are very simple. For example, the problem is not how to consolidate partially empty drums into a single drum for waste disposal but rather why weren't the drums completely emptied to begin with.

Employees who are familiar with process equipment can often contribute valuable ideas to help in the technical feasibility. Often, by listening to employee suggestions and using engineering skills, simple, common sense solutions to the problem may become evident.

Performing a technical feasibility evaluation requires a comprehensive knowledge of Source Reduction techniques, vendors, relevant manufacturing processes, company resources, and limitations of the facility. Since this may be overwhelming for the small businesses, a consultant may again be necessary. For equipment-related options or process changes, the assessment team may wish to arrange visits to see existing installations.

Waste can be prevented before it becomes a potential problem by selecting up to date equipment that prevents pollution and is efficient. Since there may be several types of equipment to choose from, making the best choice is not always an easy task. Equipment vendors can also be of use and will sometimes install equipment on a trial basis. If using a vendor, it is advisable to seek second opinions and to work with more than one vendor.

Worksheet 12 provides a list of questions to help evaluate each Source Reduction option's technical feasibility. **In question #15 it is important to note that concentration is not Source Reduction. Reduction in water usage may have the ultimate effect of increasing pollutant concentrations in the wastewater. Therefore, any reduction in water usage without a corresponding reduction in pollutants in the water should be handled cautiously.**

The last part of this worksheet includes space for final comments about the technical feasibility of the Source Reduction option under consideration. This should help to justify or explain the Source Reduction option selection. Comments may include especially detrimental or beneficial results of the option.

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Worksheet 12

Technical Feasibility

TNRCC

Option: _____

Questions:

1. Is space available or will new construction be required?

2. Are utilities available or must these be installed?

3. Is the new equipment or technique compatible with current operating procedures, work flow, and production rates?

4. Will product quality be maintained?

5. How soon can the system be implemented?

6. Will installation stop production? How long?

Option: _____

Questions Continued:

7. Will training be required for the new system?

8. Does the system alleviate or create human health and environmental problems?

9. Is the system safe?

10. Are there any regulatory barriers? Are permits necessary?

11. Does the vendor provide acceptable service?

12. Did production, maintenance, and purchasing groups contribute to the technical evaluation?

13. Is additional labor required?

Option: _____

Questions Continued:

13. Is new design required for the system? Can the design be done in-house?

14. Does a similar system currently exist?

15. Could water use reductions result in a more concentrated wastewater?

16. Could the system result in the release of a different pollutant or contaminant, or shift the release to another medium? If so, describe.

17. What is the approximate time estimate of the project completion?

18. What impact does failure of the system have on production, and is a backup system required?

Comments:

Economic Evaluation

The pollution prevention option you are analyzing may decrease the amount of hazardous waste you generate and it may be technically feasible; but, is it economically feasible? An economic evaluation will determine the economic feasibility of your option.

The economic evaluation methods presented in this manual are standard measures of project profitability:

1.) **Payback Period** (Worksheet 15)
2.) **Return on Investment** (Worksheet 15)

These methods are presented as recommendations for plants without existing economic evaluation methods.

In using these methods you will need to prepare the following cost estimates:

1.) **Capital Costs** (Worksheet 13)
2.) **Incremental Operating Costs** (Worksheet 14)

These cost estimates will be based on the plans developed for your technical analysis. Depending on the size of the option you're studying, your cost estimates may be very easy to prepare or they may be complicated, and require that you seek outside engineering and/or cost estimating assistance.

For smaller facilities with only a few processes, the entire pollution prevention assessment procedure will tend to be much less formal, and obvious options (ie. good operating practices; installation of flow controls) may be implemented with little or no economic evaluation.

It is likely that you will refine your economic evaluation as you gain information on your pollution prevention option. Your initial evaluation may be very crude and be based on "Back of the Envelope" cost estimates. If your initial evaluation looks good, you will probably refine your cost estimates in order to gain confidence in the project's economic viability. As additional information is obtained, this refining process usually continues, even after the decision is made to implement the option.

Capital Costs

Capital costs include the costs of getting your option built, installed and working. These costs include the fixed capital costs for designing, purchasing, and installing equipment as well as costs for working capital, permitting, training, start-up, and financing.

Worksheet 13 is provided for your Capital Cost estimate.

Incremental Operating Costs and Revenue

Reducing or avoiding present and future operating costs associated with hazardous waste treatment, storage, and disposal is the major economic reason to develop a pollution prevention program. In order to measure the amount of these savings (or losses) this manual uses incremental operating costs to compare costs for your existing system with costs for the proposed option. “Incremental operating costs” represent the difference between the estimated operating costs associated with the pollution prevention option, and the actual operating costs of the existing system (without the option).

Worksheet 14 describes incremental operating costs and revenues (savings or losses).

Profitability Analysis

In this manual we present two methods for measuring your project’s profitability:

1.) Payback Period
2.) Internal Rate of Return (IRR)

The **Payback Period** for a project is the amount of time it takes to recover the initial cash outlay on the project.

The **Internal Rate of Return (IRR)** is a discounted cash flow rate of return method, that is similar to calculating the interest you earn on a bank account. For projects with low risk, an aftertax IRR of 12 to 15 percent is typically acceptable. Many companies use this method for ranking capital projects that are competing for funds.

Worksheet 15 presents more information on profitability analyses.

Benefits

The bottom line for most companies to implement a pollution prevention project is (1) How much will it cost?, (2) How much will it save?, and (3) What is the return on investment? To be accepted the cost should be low, the savings high and the return on investment high. Sometimes however, a pollution prevention project’s costs will outweigh the savings. If so remember **there are other benefits to pollution prevention** that may, in the long run, provide substantial economic gain. Examples include eliminating future liability risks, reduction of regulatory paperwork, and public perception. To review these benefits refer to Chapter 1.

Worksheet 13
Capital Costs

Capital cost items listed on the worksheet are detailed below. It is likely that for smaller projects some of the cost items may be disregarded (ie. site development, contractor's fees, interest, etc.).

If you are unfamiliar with the preparation of capital costs you may wish to refer to:

1.) Perry, *Chemical Engineer's Handbook* (1985);
2.) Peters and Timmerhaus, *Plant Design and Economics* (1980).

If you need help in preparing your cost estimates you may consider the use of a contractor. Engineering and Environmental Contractors can be found in the yellow pages of your telephone directory, or you can consult "Texas Environmental Industry Guide" (Austin Publishing, Inc., P.O. Box 200700, Austin, Texas 78720-0700; (512) 343-1218).

Capital Investment for a Typical Large Project

Direct Capital Costs

Site Development
- **Demolition and Alteration Work**
- **Site Clearing and Grading**
- **Walkways, Roads, and Fencing**

Process Equipment
- **All Equipment Listed on Flow Sheets**
- **Spare Parts**
- **Taxes, Freight, Insurance, and Duties**

Materials
- **Piping and Ducting**
- **Insulation and Painting**
- **Electrical**
- **Instrumentation and Controls**
- **Buildings and Structures**

Connections to Existing Utilities and Services
- **(Water, HVAC, Power, Steam Refrigeration, Fuels, Plant Air and Inert Gas, Lighting, and Fire Control)**

New Utility and Service Facilities
- **(Same Items as Above)**

Other Non-Process Equipment

Construction/Installation
- **Construction/Installation Labor Salaries and Burden**
- **Supervision, Accounting, Timekeeping, Purchasing, Safety, and Expediting**
- **Temporary Facilities**
- **Construction Tools and Equipment**
- **Taxes and Insurance**
- **Building Permits, Field Tests, Licenses**

Indirect Capital Costs
- **In-House Engineering, Procurement, and Ohter Home Office Costs**
- **Outside Engineering, Design, and Consulting Services**
- **Permitting Costs**
- **Contractor's Fees**
- **Start-Up Costs**
- **Training Costs**
- **Contingency**
- **Interest Accrued During Construction**

Working Capital
- **Raw Materials Inventory**
- **Finished Product Inventory**
- **Materials and Supplies**

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Worksheet 13

Capital Costs

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Cost Item	Cost
Direct Capital Costs	
Site Development	
Process Equipment	
Materials	
Utilities and Services	
Other Non-Process	
Construction/Installation	
Indirect Capital Costs	
Engineering, Design, Procurement	
Permitting	
Contractor's Fee	
Start-up Costs	
Training Costs	
Contingency	
Interest accrued during construction	
Total Fixed Capital Costs	
Working Capital	
Raw Material Inventory	
Finished Product Inventory	
Materials and Supplies	
Total Working Capital	
Total Capital Investment	
Salvage Value	

Worksheet 14
Incremental Operating Costs and Revenue

Incremental operating costs are the difference between the estimated operating costs of your pollution prevention option and the actual operating costs of the existing system (without the option). Incremental operating costs and incremental revenues typically associated with pollution prevention projects include the following:

Operating Costs and Savings Associated

(References in parentheses refer to worksheet line items)

Reduced waste management costs **(Disposal)**
This includes reduction in costs for:
Offsite treatment, storage, and disposal fees; state fees and taxes on hazardous waste generators; transportation costs; onsite treatment, storage and handling costs; permitting; reporting; recordkeeping

Input material costs savings **(Raw Materials)**
An option that reduces waste usually decreases the demand for input material

Changes in Utility Costs **(Utility Costs)**
Utilities costs may increase or decrease. This includes steam, electricity, process and cooling water, plant air, refrigeration, or inert gas.

Changes in costs associated with quality **(Quality)**
A Source Reduction/Waste Minimization option may have a positive or negative effect on product quality. This could result in higher (or lower) costs for rework, scrap, or quality control functions.

Changes in operating and maintenance labor, burden, & benefits. **(Labor)**
An option may either increase or decrease labor requirements; which will impact direct labor costs as well as burden and benefits.

Changes in operating and maintenance supplies. **(Supplies)**
An option may result in an increase or decrease in the use of supplies.

Changes in insurance and liability savings. **(Insurance)**
An option that significantly reduces hazardous waste may reduce a company's insurance premiums.

Changes in overhead costs. **(Overhead)**
Large Source Reduction/Waste Minimization projects may affect a plant's overhead costs.

Changes in revenues from increased (or decreased) production.
An option may result in an increase or decrease in the productivity of a plant; which will result in a change in revenues and/or costs.

Increased revenues from by-products.
An option may produce a by-product that can be sold to a recycler or sold to another company as a raw material.

If you need help preparing your "Incremental Operating Costs and Revenue" worksheet, please refer to the references listed for the "Capital Cost" worksheet.

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Worksheet 14

Incremental Operating Costs and Revenue

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Operating Cost/Revenue Item	$ per Year
Operating Costs	
Decrease (or increase) in Disposal	
Decrease (or increase) in Raw Materials	
Decrease (or increase) in Utility	
Decrease (or increase) in Quality	
Decrease (or increase) in Labor	
Decrease (or increase) in Supplies	
Decrease (or increase) in Insurance	
Decrease (or increase) Overhead	
Total Decrease (or increase) in Operating Costs	
Revenue	
Incremental Revenue from Increased (Decreased) Production	
Incremental Revenue from Marketable By-products	
Incremental Revenue	
Net Operating Cost Savings (Loss)	

Worksheet 15
Profitability

The **Payback Period** is the amount of time it takes to recover the project's initial cash outlay. The formula for calculating the pretax payback period is given on the worksheet.

As an example of the use of the formula, suppose you install a piece of equipment at a total cost of $120,000. If the piece of equipment is expected to save $48,000 per year, the payback period is 2.5 years.

Based solely on consideration of the payback period, projects with a shorter payback period are preferred to projects with longer payback periods. **Payback periods of up to three or four years are generally considered acceptable low-risk investments.**

Many companies use the **Internal Rate of Return (IRR)** for ranking capital projects that are competing for funds. Although the IRR is preferred to payback period as a method for determining economic viability of your project, it's calculation is also more involved. **This portion of the worksheet is therefore optional depending on the company's ability to calculate IRR or hire a consultant who can.**

If your company does not employ IRR and you would like to learn more about the method, there are sources of help. Financial management, cost accounting, and engineering economics texts present information on determining IRR. For engineers, a particularly useful text is:

> *Economic Evaluation and Investment Decision Methods*, by Franklin J. Steremole (Investment Evaluation Concepts, 2000 Golden Drive, Golden, Colorado 80401). Also, many popular spreadsheet programs for personal computers (including Lotus 1-2-3) will calculate IRR.

The IRR is the discounted cash flow rate of return for your project, and can be thought of as the interest earned on the money invested in your project. The interest rate (IRR) increases as the project becomes more profitable. For investments with a low level of risk, **an aftertax IRR of 12 to 15 percent is typically acceptable.**

Using the IRR methods you will need to project future net operating cost savings, capital costs, loan interest and repayment, salvage values, depreciation, and taxes. You will sum these revenues and costs on an annual basis in order to calculate annual cash flows. The cash flows are discounted at an interest rate (the IRR) which yields a Net Present Value of zero.

In preparing the IRR analysis, it is often useful to study a project's profitability under optimistic and pessimistic scenarios (such as an unanticipated increased capital cost). These studies are known as **Sensitivity Analyses**. The worksheet contains lines to include four sensitivity analyses; 1.) 25% increase in capital cost; 2.) 25% decrease in capital cost; 3.) 25% increase in net operating savings; 4.) 25% decrease in net operating savings. You may wish to expand the number of sensitivity analyses and focus on additional (or more specific) key variables (ie. changes in project life, revenues, or permitting cost).

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Worksheet 15

Profitability

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Payback Period

Total Capital Investment ($) (From Worksheet 13) _____

Annual Net Operating Cost Savings ($ per year - From Worksheet 14) _____

Payback Period (in years):

Total Capital Investment

Annual Net Operating Cost Savings _____

Internal Rate of Return (IRR)

The After-tax Internal Rate of Return for this project is: _____ %

Sensitivity Analyses:

1.) Capital Costs + 25% _____ %

2.) Capital Costs – 25% _____ %

3.) Operating Costs + 25% _____ %

4.) Operating Costs – 25% _____ %

5.) _____ _____ %

6.) _____ _____ %

7.) _____ _____ %

8.) _____ _____ %

9.) _____ _____ %

10.) _____ _____ %

Worksheet 16
Waste Reduction Project Prioritization

Now that the technical and economic feasibility of each project has been evaluated, you can use this worksheet to help prioritize and select the best possible project options. The prioritized list may represent the order of implementation or the order of importance. The most important projects may not be implemented in the order of importance. You may want to pick projects that are easy to implement, "low hanging fruit". Many small easy successes can help lay a firm foundation for later large scale projects. In any event, showing the rationale for the rank order of projects in the plan helps all plan users understand the nature of the plan.

Worksheet 16, "Waste Reduction or Release Project Prioritization," includes space for three projects. More copies of this worksheet should be made for additional projects. Questions 1 thru 4 require an actual number to be placed in the "Total" column, then after comparing the totals for each project the projects should receive a ranking in order of their desirability for that criteria. For example on question number 1, if project 1 reported a disposal cost of $2 million a year, and project 2 reported $1 million a year, then their ranking would be 2, and 1 respectively. Project 2 would receive the highest ranking (1) because the costs of disposal are lowest, thus more would be gained by this project.

Example

Priority Rating Criteria:	**Project: 1**		**Project: 2**	
	Total	**Rank**	**Total**	**Rank**
1. Cost of disposal	2$ mill/yr	2	$1 mill/yr	1
. . . . .				
7. Processing problems		2		1
	Rank Total		**Rank Total**	
		4		2
Priority Rank		2		1

Questions 5 thru 7 do not require a "Total" since they are not quantifiable, however they can still be ranked by comparing the projects to one another. For example Project 1 above received a 2 for processing problems since there are more problems associated with this project than project 2. Space is available after question 7 for additional criteria if the task force wants to include them.

At the bottom of the worksheet are three columns titled "rank total," and under this the sum of the rank column for each project should be recorded. Then, based on that score, each project should be prioritized. The lowest rank total will be the first priority, and the highest total will be the last priority.

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Worksheet 16

Waste Reduction or Release Project Prioritization

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Priority Rating Criteria:	**Project:**		**Project:**		**Project:**	
	Total	**Rank**	**Total**	**Rank**	**Total**	**Rank**
1. Future cost of disposal						
2. Future raw material cost						
3. Current amount of waste generated or toxic released						
4. Projection of potential waste reduction						
5. Risk to workers, public and the environment						
6. Environmental regulations						
7. Processing problems						
	Rank Total		**Rank Total**		**Rank Total**	
Priority Rank						

5

Implementation

Introduction

The product of the pollution prevention assessment and feasibility analysis should be oral and written reports. These reports will be used to justify the project to management and to obtain funding.

Pollution prevention options that involve operational, procedural, or material changes (without additions or modifications to equipment) will likely be implemented without detailed documentation or presentations. For projects involving equipment modifications, the installation of new equipment, or major capital expenditures, you will likely be asked to include extensive documentation.

This chapter covers subjects you may want to include in your written documentation and oral presentations. In addition, the chapter covers scheduling the implementation of your project and evaluating its effectiveness after it is implemented.

Justify Your Project and Obtain Funding

A.) Documentation

A good final report can be an important tool for convincing your management to fund your pollution prevention project.

Your report should review all phases of your assessment. Before the report is submitted, it is important to review the results with the affected departments and to solicit their support. Reviews by the department representatives can increase the chances of receiving approval of your management.

Of primary concern to your management will be:

1.) **What will this project do?** (eg. increase production, decrease costs, keep the plant in compliance with the law, reduce liability exposure, reduce exposure of the public and environment to risk, etc.).

2.) **What is the project?** (Location, equipment, personnel, infrastructure, timing of implementation).

3.) **What will the project cost?** (Initial Capital and Net Operating Cost).

4.) **Is the project Profitable?**

In answering these questions remember that the need you see for your pollution prevention project may not be apparent to your management; therefore, you should carefully describe what the project will do for your plant and the company. If the project's main impact is to keep the plant in compliance with the law, you should consider including references to significant statutes and penalties.

Any reduction of environmental risk should specifically be included. Any financial benefits that the project may bring should be highlighted.

Worksheet 17 "Documentation" reviews items you may wish to include in your final report.

B.) Presentations

It is likely you will be called upon to give a presentation to your management concerning the project you are proposing. Time permitting, the items you cover should be the same as those given in your written documentation (Worksheet 15).

You may not be given enough time to present all of the information included in your written report. If this is the case you might consider:

1. *Use of overhead projections.* Keep the overheads simple. Make a single point with each overhead.

2. *Simplify and present only the results and recommendations.* Present simplified summary tables and technical information from your written report. Involve members of your task force and assessment teams. Ask them to attend the presentation and to be ready to present detailed information on areas of their expertise.

3.) *Try for a short presentation.* If you can keep it under 15 minutes you will probably be able to keep your supervisors interested. Let them ask for more detail if they want it.

Notes

Worksheet 17
Documentation/Presentation

Most large companies have existing formats for presenting project proposals; however, if your company does not you may consider including those items listed on the attached table.

Documentation – Items to Consider Including

Summary

- **State the problem**
- **State the proposed solution**
- **State the benefits of the solution economic, legal, other**

Introduction

- **Statement of the problem your project will solve. Include any of your waste assessment data needed for support (i.e. tons of waste) as well as legal situations.**
- **Statement of proposed solution. Brief introduction to the proposed solution.**
- **Statement relating the problem and solution to the company's environmental policy, and your plant's hazardous waste goals.**

Environmental Review

- **Chemical/compound characteristics**
- **Human health risks**
- **Risks to the environment**

Technical Review

- **Review the proposed technology, with mention of successful applications.**
- **Review the required resources and how they will be obtained (ie. equipment, personnel, permits).**
- **Estimate the construction period (if any), and production downtime.**
- **Review how the project's success will be evaluated.**

Economic Review

- **Review the proposed capital cost.**
- **Review the proposed net operating savings (costs).**
- **Review the payback period and/or IRR and sensitivity analyses for the proposed project.**

Conclusion

- **Restate the problem and the proposed solution.**
- **If warranted, make recommendations (i.e. recommend further assessments; recommended contractors; changes to the plant's goals).**

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Worksheet 17

Documentation/ Presentation

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Documentation/Presentation Checklist	
Documentation	
Summary	
Introduction	
Statement of problem	
Statement of solution and options	
Environmental Review	
Chemical/compound characteristics	
Human health risks	
Risks to the environment	
Technical Review	
Proposed technology	
Construction period	
Evaluation criteria	
Economic Review	
Capital cost	
Operating cost	
Economic analyses	
Conclusions	
Presentation	
Overheads	
Simplified Tables	
Short Presentation	

Worksheet 18
Implementation/Installation

Once your management has approved your pollution prevention project, implementation can begin. Worksheet 18 is a checklist of steps for implementation/ installation. Implementation will generally follow the procedures established by your firm for any new procedure, process modification, or equipment change. Implementing a major pollution prevention project typically involves several steps as described below.

Pollution Prevention Implementation

- ***Preparing a detailed design.*** **At this stage, it is helpful to confer with representatives from production, maintenance, safety, and other departments who may be affected by the change or who may have suggestions regarding equipment manufacturers, layout, scheduling, or other aspects of implementation.**

- ***Preparing a construction bid package and equipment specifications.*** **If construction is required, details of the necessary construction will need to be assembled into a construction bid package. Depending on the established procedures in your company, you will need to establish specifications for new equipment or to specify particular manufacturers and models.**

- ***Selecting construction staff and purchasing materials.*** **Construction may be performed by an in-house or outside company, depending on cost and availability.**

- ***Installing new equipment.*** **Construction will generally involve installation of the necessary equipment. Timing may be critical in some operations (e.g., only two scheduled four-day shutdowns of the process per year).**

- ***Training personnel.*** **Personnel from maintenance as well as production may have to receive training. Proper operation and maintenance are critical for effective, safe, trouble-free operation. Training is sometimes available from equipment vendors.**

- ***Starting operation.*** **Extra care should be exercised during the initial stages of operation to ensure that all proceeds smoothly; often first impressions of the effectiveness of the system are lasting.**

- ***Monitoring and evaluating performance.*** **Monitoring typically is an integral part of operation, and is performed by the production staff. Additional information on evaluating the performance of your project is given on the next worksheet.**

From: ***New York State Waste Reduction Guidance Manual,*** **March 1989, page 6-2.**

The first step in implementation/installation of the option is to record the start date, and the last step is to record the completion date. You will want to plan ahead and target start dates and completion dates for all phases which can later be changed if necessary.

One of the most important steps to the implementation/installation of an option is to receive guarantees from the vendor or equipment dealer regarding the equipment you purchase. Your vendor should allow you time to bench-scale-test their equipment. If they do not, find another vendor. This can be especially important if you are dealing with an expensive piece of equipment. Between steps three and four on worksheet 18 you may want to add the item "bench-scale-test".

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Worksheet 18

Implementation/ Installation

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Implementation/Installation Schedule	Start Date	Completion Date
Prepare a detailed design.		
Prepare a construction bid package and equipment specifications.		
Select construction staff and purchase materials.		
Install new equipment.		
Train personnel.		
Start operation.		
Start performance monitoring and evaluation.		

Worksheet 19
Evaluate Performance

The easiest way to evaluate the performance of your waste reduction project is to:

1. Measure if it meets its expected economic benefits (eg. net operating cost savings, IRR), and

2. Measure waste reduction by recording the quantities of waste generated before and after the project is implemented.

Measurements of economic benefits can be made by comparing your realized savings and IRR to those projected in your economic analyses **(see Worksheet 15).** Measurements of waste reduction are a bit more involved.

The easiest way to measure waste reduction is to record the quantities of waste generated before and after you implement your project. Measurements before the implementation should be recorded on the worksheet as **baseline** measurements; and as **actual** for measurements made after implementation (**projected** would be used for the measurements you planned on obtaining when you designed the project). You will likely generate a minimum of three measurement sets on this form; baseline, actual, and projected.

The worksheet is designed to allow you to measure the **weight** of both the toxic **material** you put into your process as well as the **waste streams** emitted from the process. The simple measurement of the weight of hazardous material fed to the process or waste emitted from the process may ignore factors which affect the quantity of waste generated; this is particularly true for your plant's **production rate.**

In general, waste generation is directly dependent on the rate you are producing your finished product. When your production of goods increases you expect your waste generation to go up. If you are relying solely on measurements of the **weight**, the effect of a production increase (or decrease) could mask the effect of your pollution prevention project. Therefore, this worksheet provides you with a second method of calculating your project's effectiveness. Keep in mind however, that waste generation, while directly dependent on production, may not be in a linear relationship to production.

This method divides the weight of the material used (or waste generated) by the amount of finished goods manufactured by your process (eg. gallons of product, number of cans, etc.). The calculation is labeled **weight/unit product**. Although this method of measuring waste reduction does take into consideration your production rate there are still other factors that could cause you problems.

For example, periodic (e.g. once every 3 years) plant maintenance can cause one time increases in your generation of hazardous waste which could cause problems in evaluating your data. Care should be taken when expressing the extent of waste reduction, and in general, a distinction should be made between production-related wastes and maintenance-related wastes and clean-up wastes.

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Worksheet 19

Performance Evaluation

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Option Description _____

❒ **Baseline** ❒ **Projected** ❒ **Actual**

(a) Period Duration_____ From_____ To_____

(b) Production per Period _____ Units (_____)

(c) Input Materials Consumption per Period:

Material	Weight	Weight/Unit Product

(d) Waste Generation per Period:

Material	Weight	Weight/Unit Product

(e) Substance(s) of Concern–Generation Rate per Period:

Waste Stream	Substance	Weight	Weight/Unit Product

Notes

6

Pollution Prevention Plan Requirements

Environmental concerns have increased recently, and there is a growing need to prevent pollution. The state of Texas, due to Senate Bill 1099, now requires a pollution prevention plan for many businesses. For this reason, and because companies are recognizing the importance of protecting human health and the environment, all companies should incorporate a pollution prevention plan into their overall business plan.

This chapter is designed to guide any and all businesses in establishing a pollution prevention plan as required in Texas. The first section in this chapter will outline some of the requirements of the pollution prevention rules (the rules are provided in Appendix A). The next sections will offer three possible methods for preparing a plan. You may use one of these methods or develop your own.

Overview of Pollution Prevention Rules

The pollution prevention riles apply to the following groups:

(1) All large-quantity generators of hazardous waste.
(2) All small-quantity generators of hazardous waste.[1]
(3) All persons subject to TRI reporting (SARA Title III).

These groups must prepare a five year or more plan to keep on-site for inspection. The due date for the plan is dependent on the previous years amounts of hazardous waste generated or TRI chemicals released. The following is a schedule of plan due dates:

- If a facility reported 5,000 tons or more of hazardous waste, or 100 tons or more of releases and transfers of TRI chemicals in 1992, then their plan is due July 1, 1993.

- If a facility reported 500-5,000 tons of hazardous waste, or 10-100 tons of releases and transfers of TRI chemicals in 1993, then their plan is due January 1, 1994.

- If a facility reported 15-500 tons of hazardous waste, or 5-10 tons of releases and transfers of TRI chemicals in 1994, then their plan is due January 1, 1995.

[1] A modified plan may be used by the small quantity generators (SQGs who are not TRI reporters). This plan is equivalent to Worksheet 20. See appendix A for specific SQG requirements.

- If a facility reported 5-15 tons of hazardous waste, or 1-5 tons of releases and transfers of TRI chemicals in 1995, then their plan is due January 1, 1996.

- If a facility reported 1.102 tons of hazardous waste, or less than 1 ton of releases and transfers of TRI chemicals in 1996, then their plan is due January 1, 1997.

To determine the need to prepare a SR/WM plan, review your Annual Waste Summaries (submitted to the TNRCC-Industrial Hazardous Waste Division each January) and your Toxic Release Inventory Form Rs (submitted each July to the EPA since 1992). Total your facility's waste streams on your Annual Waste Summary which are coded as hazardous (those which end in an H or begin with a 9) in tons for each year, then estimate your current year's total hazardous waste generated based on your monthly manifests, production, etc. If applicable, review your TRI Form Rs submitted and sum section 5 and 6 for each chemical for each year, then estimate your current year's total based on emissions, production, etc. If your total for either hazardous waste or TRI is close to or over the threshold value, you should begin your plan preparation.

If your facility has more than one EPA, Solid Waste (5-digit) or TRI identification number, you should report under each number. In special circumstances, the TNRCC will allow more than one set of identification numbers per plan. Please discuss this issue with the TNRCC Industrial Pollution Prevention Team prior to submittal, and always note all applicable identification numbers on any correspondence.

If a new facility is built or an old facility expanded within these dates and the rules suddenly apply to it, the facility has 90 days to have the plan in place. For example, if in October 1995, a company expands and increases the amount of toxics released and transferred (at least over 15 tons) then according to the rules a plan should be in place within 90 days.

Submittals to the TNRCC

As previously mentioned the plan is kept on-site. The executive summary and the Certificate of Completeness & Correctness portions of the plan are required to be submitted to the TNRCC at: TNRCC, Office of Pollution Prevention and Recycling, MC 112, Industrial Pollution Prevention, P.O. Box 13087, Austin, TX 78711-3087. Please mark SR/WM Executive Summary or SR/WM Annual Report on the envelope. If you have questions about submissions or WRPA requirements, call (512) 239-3100 or fax (512) 239-3165. Please do not fax your SR/WM Plans, Executive Summaries, or Annual Progress Reports unless you are requested to do so by the TNRCC.

Facilities will also be required to submit an annual report due July 1, the year after the plan is due. For example, if the plan is due January 1, 1995, the first report is due July 1, 1996. An annual report from will be mailed to each facility that has submitted a SR/WM Executive Summary the prior year. SR/WM Annual Progress Report Forms and Instructions may also be ordered using the TNRCC order Form in Appendix E document RG-112).

Facilities are welcome to send in their entire SR/WM plan (in addition to the Executive Summary and Certificate of Completeness and Correctness) to the TNRCC; however, in doing so the plan becomes a public document (unless otherwise requested by the facility). Please do not send in binders as they do not fit in our filing system and will be recycled.

Exemptions

According to the rules conditionally exempt small-quantity generators and facilities regulated by the Railroad Commission of Texas under the Natural Resources Code are exempt. In addition, companies that would like to apply for an exemption may do this on a case-by-case basis to the Executive Director. This request for exemption must be resubmitted each year. The criteria for exemption will be based on the Executive Director's assessment of the following:

(1) the facility has reduced the amount of pollutants and contaminants generated or released by 90% since the base year (1987, or first complete year of operation);

(2) the potential impact on human health and the environment of any remaining hazardous waste generated, or pollutant or contaminant released; and

(3) a demonstration that additional reductions are not economically and technically feasible.

The facility must be able to demonstrate these criteria to the satisfaction of the Executive Director in order to be granted an exemption. The facility should then consider which would be more difficult, obtaining an exemption annually, or preparing a plan once. Very few exemptions have been granted, and nearly all have been cases of facilities closing down or no longer generating any hazardous wastes whatsoever. If you believe you do qualify for an exemption, please contact the TNRCC at the address above.

Enforcement

Failure to have the plan or the annual report, as described in the rules, on the specified date is considered a violation of the Texas Administrative Code (TAC) and can result in penalties of up to $10,000 a day per violation. Failure to meet the reduction goals as stated in the facilities plan **is not a violation**.

How to Prepare a Pollution Prevention Plan

This manual includes three possible methods of preparing a pollution prevention plan. None of these methods are required, they are suggested, and may be used, altered, or not used. However, the plan must meet all the requirements of the rules (see Appendix A).

The first method is ideal for a facility that is new to pollution prevention and has never done a pollution prevention assessment or plan. This method is designed using the worksheets from the assessment manual.

The second method was developed by the Texas Chemical Council with the assistance of the TWC Office of Pollution Prevention & Conservation. This method is ideal for the experienced and larger facilities.
The third method was developed by the Southern Division Naval Facilities Engineering Command, the Lead Maintenance Technology Center (LMTC) for the Environment out of Naval Aviation Depot Jacksonville and Naval Air Station Dallas. This method is ideal for a project or process oriented approach. This method is

Method 1: Assessment Worksheets

appropriate for any size facility that has some experience in pollution prevention.

Each worksheet in the manual has a box for Source Reduction and a box for Waste Minimization. The appropriate box should be checked for each project and then all the Source Reduction worksheets should be gathered and placed in one section of the plan, and the Waste Minimization worksheets placed in the other section of the plan. Both parts of the plan should then be stored in a secure location where they can easily be found.

The outline below contains all the important information for completing the Source Reduction and Waste Minimization plan as required by Senate Bill 1099. This bill also includes a list of possible additions to the Source Reduction/Waste Minimization plan which are not required, but may be included. Under this statute the plan itself remains confidential and at the facility for inspection by TNRCC inspectors. The Executive Summary, however, is required to be made available to the public by the facility. We suggest the Executive Summary be placed in your local library for easy public access.

I. Initial survey

An initial survey of the facility's activities which will identify those activities that cause hazardous waste, and/or will identify activities that result in the release of pollutants or contaminants. This is usually accomplished by a facility audit or assessment as described in Chapter 3.

- Worksheet #6, "Process and Waste Stream Data"
- Worksheet #7, "Waste Stream or Release Summary"

II. Prioritized list of projects

A. A list of prioritized Source Reduction projects, based upon information obtained during the initial survey, which are economically and technologically feasible.

- Worksheet #16, "Waste Reduction/Release Project Prioritization"

B. A list of prioritized Waste Minimization projects, based upon information obtained during the initial survey, which are economically and technologically feasible.

- Worksheet #16, "Waste Reduction/Release Project Prioritization"

III. Source reduction projects

A. A discussion of technical and economic considerations in selecting each project to be undertaken.

- Worksheet #12, "Technical Feasibility"
- Worksheet #13, "Capital Costs"
- Worksheet #14, "Incremental Operating Costs and Revenue"

B. A discussion of environmental and human health risks considered in selecting each project to be undertaken.

- Worksheet #8, “Assessment of Risk to Human Health & the Environment”

C. An identification and discussion of cases in which the implementation of a Source Reduction activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium.

- Worksheet #12, “Technical Feasibility”

D. An estimate of the type and amount of reduction anticipated.

- Worksheet #10, “Option Description”

E. A discussion of Source Reduction goals for the project, including incremental goals to aid in evaluating progress.

- Worksheet #3, “Goals”

F. A schedule for the implementation of each Source Reduction project.

- Worksheet #18, “Implementation / Installation”

IV. Waste Minimization projects

A. A discussion of technical and economic considerations in selecting each project to be undertaken.

- Worksheet #12, “Technical Feasibility”
- Worksheet #13, “Capital Costs”
- Worksheet #14, “Incremental Operating Costs and Revenue”

B. A discussion of environmental and human health risks considered in selecting each project to be undertaken.

- Worksheet #8, “Assessment of Risk to Human Health & the Environment”

C. An identification and discussion of cases in which the implementation of a Waste Minimization activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium.

- Worksheet #12, “Technical Feasibility”

D. An estimate of the type and amount of reduction anticipated.

- Worksheet #10, “Option Description”

E. A discussion of Waste Minimization goals for the project, including incremental goals to aid in evaluating progress.

- Worksheet #3, “Goals”

F. A schedule for the implementation of each Waste Minimization project.

- Worksheet #18, “Implementation / Installation”

V. Facility goals

A. An explanation of Source Reduction and Waste Minimization goals for the entire facility.

- Worksheet #3, “Goals”

B. An explanation of incremental goals for the entire facility.

- Worksheet #3, “Goals”

VI. Employee awareness and training programs

An explanation of employee awareness and training programs to aid in accomplishing Source Reduction and Waste Minimization goals.

- Worksheet #4, “Employee Training Program”

VII. Executive summary

An executive summary of the plan (included at the end of this outline) which shall include at a minimum:

A. A description of the facility which shall include:
   1. Name of the facility
   2. Address
   3. Contact
   4. General description of the facility
   5. TNRCC account number, TNRCC solid waste notice of registration number, TNRCC wastewater permit number, EPA identification number (RCRA number), National Pollutant Discharge Elimination System (NPDES) permit number, and underground injection well code identification number.

B. A list of all hazardous wastes generated and the volume of each

C. A list of all reportable TRI releases and the volume of each
D. A prioritized list of pollutants and contaminants to be reduced
E. A statement of reduction goals
F. An explanation of environmental and human health risks considered in determining reduction goals
G. Implementation milestones for individual project development
H. An implementation schedule for future reduction goals
I. Identification and description of cases in which the implementation of a Source Reduction or Waste Minimization activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium. Included in this description shall be a discussion of the change in characteristic of the normal waste stream or release and how it will be managed in that affected medium.

- Worksheet #20, "Executive Summary"

VIII. Certification

Certification by the owner of the facility, or, if the facility is owned by a corporation, by an officer of the corporation that owns the facility who has the authority to commit the corporation's resources to implement the plan, that the plan is complete and correct.

- Worksheet #21, "Certification of Completion". This worksheet follows after the Executive Summary.

IX. Optional additional information

The Source Reduction and Waste Minimization plan may also include:

A. A discussion of previous efforts at the facility to reduce risk to human health and the environment or to reduce the generation of hazardous waste or the release of pollutants or contaminants.
B. A discussion of the effect which changes in environmental regulations have had on the achievement of Source Reduction and Waste Minimization goals.
C. The effect that events have had on the achievement of Source Reduction and Waste Minimization goals. This would include events beyond control such as hurricanes, a depression, etc.
D. A description of projects that have reduced the generation of hazardous waste or the release of pollutants or contaminants.
E. A discussion of the operational decisions made at the facility that have affected the achievement of

Worksheet 20
Executive Summary

The last two worksheets can be found on the last pages of this chapter. The executive summary, Worksheet 20, “Executive Summary”, should be written by the person most involved and familiar with the Source Reduction/Waste Minimization plan; probably the Task Force Leader. This worksheet contains all the requirements of the Texas Administrative Code found in Section 335.474.

Key to Executive Summary, Part 1

IT IS VERY IMPORTANT THAT THE BOLD PORTIONS OF THE FORM MUST BE CORRECT - if these items are reported incorrectly, your submission may not be properly credited to your facility. Please take extra time to ensure that these are correct. For all identification numbers, if not applicable, please use NA. Also, for any type of identification number, if there is more than one identification number for your facility, please include all identification numbers.

1. Facility Name: Include the facility name you use to report TRI and hazardous waste
2. Name, Address of Contact: Please provide the name, title, address and phone number of the individual who should receive information from the TNRCC about pollution prevention

NOTE: If this is at a different address than the facility itself, please state this and include the actual facility mailing address.

3. Plan Date: Date of actual submittal
4. EPA ID#: Begins with TX; on manifests
5. SW ID#: On Notice of Registration or Annual Waste Summary
6. TRI ID#: On form R if facility is TRI reporter
7. TNRCC Air Acct#: Old Texas Air Control Board Account number; on air permits
8. NPDES Permit#: EPA Wastewater permit number
9. UI Well Codes: Underground Injection Well identification codes
10. Primary SIC Code: Standard Industrial Classification Code
11. Facility Description: Describe general facility operations

Firm _____	**Pollution Prevention Assessment**	Prepared By _____
Site _____	***Source Reduction*** ☐	Reviewed By _____
Date _____	***Waste Minimization*** ☐	Sheet ___ of ___ Page ___ of ___
	Proj. No. _____	

Worksheet 20

Executive Summary

TNRCC

Executive Summary — Part 1

Description of the facility:

1. **Name of the facility:** _____
2. **Contact Person:** _____
   Mailing Address: _____
   City, State, Zip: _____
   Contact phone: _____
   Cantact fax: _____
3. Plan Date: _____
   Plan Date Due (circle one): 7/93 1/94 1/95 1/96 1/97
4. **EPA ID Number (12 Digit):** _____
5. **TNRCC Solid Waste Number (5-digit; formerly TWC NOR #):** _____
6. **Toxic Release Inventory (TRI) ID Number (if applicable):** _____
7. TNRCC Air Account Number (formerly TACB #; if applicable): _____
8. NPDES Permit Number (if applicable): _____
9. Underground Injection Well Code(s) Number (if applicable): _____
   _____
10. SIC Code(s) (circle primary code): _____
11. General Description of Facility and Activities: _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

Executive Summary – Part 2

2. List all hazardous wastes generated amount for 19_____

Description of waste/ TX Waste Code Number:	**Amount generated in tons:**

TOTAL= _____

The data on this form should be taken from your Annual Waste Summary Form

Executive Summary – Part 3

3. List all reportable TRI chemicals, C.A.S. numbers and the amount released or transfered for 19___

TRI Chemicals & C.A.S. number:	**Amount releaseed or transfered in tons**

TOTAL= _____

The data on this form should be taken from your TRI Form R-Sections 5and 6 only.

Executive Summary – Part 4

4. Provide a prioritized list of pollutants and contaminants to be reduced:

1.) _____

2.) _____

3.) _____

4.) _____

5.) _____

6.) _____

7.) _____

8.) _____

9.) _____

10.) _____

11.) _____

12.) _____

13.) _____

14.) _____

15.) _____

16.) _____

17.) _____

18.) _____

19.) _____

20.) _____

Executive Summary – Part 5

5. State the Source Reduction goals for the facility:

6. State the Waste Minimization goals for the facility:

Executive Summary – Part 6

6. Explain the environmental and human health risks considered in determining reduction goals:

Executive Summary – Part 7

7. What are the implementation milestones for individual project development?

Executive Summary – Part 8

8. What is the implementation schedule for future reduction goals?

Executive Summary – Part 9

9. Identify cases in which the implementation of Source Reduction or Waste Minimization activity, designed to reduce risk to human health or the environment, may result in the release of a different pollutant or contaminant or may shift the release to another medium.

Worksheet 21
Certification of Completion

After the plan has been completed and organized it should be presented to the Chief Financial Officer, the Plant Manager, and the Task Force Leader for their review. Worksheet 21, “Certification of Completion” should be signed by the owner of the facility, or, if the facility is owned by a corporation, by an officer of the corporation that owners the facility who has the authority to commit the corporation's resources to implement the plan. By signing the Certificate of Completion, the owner (or officer) is certifying that the plan meets the specified requirements and is complete and correct.

Firm _____	**Pollution Prevention Assessment**	Prepared By _____
Site _____	***Source Reduction*** ❐	Reviewed By _____
Date _____	***Waste Minimization*** ❐	Sheet ___ of ___ Page ___ of ___
	Proj. No. _____	

Worksheet 21

Certificate of Completion

TNRCC

Certificate of Completion

This document certifies that the pollution prevention plan has been completed and meets the specified requirements of the Waste Reduction Policy Act of 1991 and 31 TAC §§335.471-335.480, and that the information provided herein is true, correct and complete.

This document also certifies that the person whose signature appears below has the authority to commit the corporate resources necessary to implement this plan.

_____

Facility Owner, signature
Print or type name and title
-or-

_____

Corporate Officer, signature
Print or type name and title

_____

Date Signed

Appendix A

TNRCC Pollution Prevention Rules (31 TAC §335, Subchapter Q)

Appendix A-TNRCC Pollution Prevention Rules (31 TAC §335, Subchapter Q)
Pollution Prevention: Source Reduction
and Waste Minimization

§335.471. Definitions.

The words and terms used in this subchapter have the meanings given in the Waste Reduction Policy Act of 1991, Senate Bill 1099, or the regulations promulgated thereunder. The following words and terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise. Further, the following words and terms, as defined herein, shall only have application to this subchapter.

Acute hazardous waste - Hazardous waste listed by the Administrator of the United States Environmental Protection Agency (EPA) under the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. §6901 et seq.), because the waste meets the criteria for listing hazardous waste identified in 40 Code of Federal Regulations, §261.11(a)(2).

Board - The Texas Air Control Board.

Commission - The Texas Water Commission.

Committee - The waste reduction advisory committee established by the Texas Solid Waste Disposal Act, Health and Safety Code Annotated, §361.0215.

Conditionally exempt small-quantity generator - A generator that does not accumulate more than 1,000 kilograms of hazardous waste at any one time on his facility and who generates less than 100 kilograms of hazardous waste in any given month.

Environment - Water, air, and land and the interrelationship that exists among and between water, air, land, and all living things.

Facility - All buildings, equipment, structures, and other stationary items located on a single site or on contiguous or adjacent sites that are owned or operated by a person who is subject to this subchapter or by a person who controls, is controlled by, or is under common control with a person subject to this subchapter.

Generator and generator of hazardous waste - Have the meaning assigned by the Texas Solid Waste Disposal Act, Health and Safety Code Annotated, §361.131.

Large-quantity generator - A generator that generates, through ongoing processes and operations at a facility:

(A) more than 1,000 kilograms of hazardous waste in a month; or

(B) more than one kilogram of acute hazardous waste in a month.

Media and medium - Air, water, and land into which waste is emitted, released, discharged, or disposed.

Pollutant or contaminant - Includes any element, substance, compound, disease-causing agent, or mixture that after release into the environment and on exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions, including malfunctions in reproduction, or physical deformations in the organism or its offspring. The term does not include petroleum, crude oil, or any fraction of crude oil that is not otherwise specifically listed or designated as a hazardous substance under §101(14)(A)-(F) of the environmental response law, nor does it include natural gas, natural gas liquids, liquefied natural gas, synthetic gas of pipeline quality, or mixtures of natural gas and synthetic gas.

Release - Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. The term does not include:

(A) a release that results in an exposure to a person solely within a workplace, concerning a claim that the person may assert against the person's employer;

(B) an emission from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine;

(C) a release of source, by-product, or special nuclear material from a nuclear incident, as those terms are defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. §2011 et seq.), if the release is subject to requirements concerning financial protection established by the Nuclear Regulatory Commission under §170 of that Act;

(D) for the purposes of §104 of the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. §9601 et seq.), or other response action, a release of source, by-product, or special nuclear material from a processing site designated under the Uranium Mill Tailings Radiation Control Act of 1978 (42 United States Code, §§7912 and 7942) §102(a)(1) or §302(a); and

(E) the normal application of fertilizer.

Small quantity generator - A generator that generates through ongoing processes and operation at a facility:

(A) equal to or less than to 1,000 kilograms but more than or equal to 100 kilograms of hazardous waste in a month; or

(B) equal to or less than one kilogram of acute hazardous waste in a month.

Source reduction - Has the meaning assigned by the federal Pollution Prevention Act of 1990, Pub.L. 101-508, §6603, 104 Stat. 1388.

Tons - 2,000 pounds, also referred to as short tons.

Toxic release inventory (TRI) - A program which includes those chemicals on the list in Committee Print Number 99-169 of the United States Senate Committee on Environment and Public Works, titled "Toxic Chemicals Subject to the Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA, 42 United States Code Annotated, §11023), 313" including any revised version of the list as may be made by the Administrator of the EPA.

Waste minimization - A practice that reduces the environmental or health hazards associated with hazardous wastes, pollutants, or contaminants. Examples may include reuse, recycling, neutralization, and detoxification.

§335.472. Pollutants and Contaminants.

The following pollutants and contaminants are subject to source reduction and waste minimization planning.

(1) all hazardous wastes generated;

(2) all chemicals which exceed threshold reporting requirements pursuant to Emergency Planning and Community Right-to-Know Act of 1986, §313.

§335.473. Applicability.

This subchapter applies to facilities which are required to develop a source reduction and waste minimization plan pursuant to the Waste Reduction Policy Act of 1991, Senate Bill 1099, or the regulations promulgated thereunder, including:

(1) all large quantity generators of hazardous waste;

(2) all generators other than large quantity generators and conditionally exempt small quantity generators as defined by Health and Safety Code, §361.431(3);

(3) persons subject to §313, Title III, Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act (EPCRA), 42 United States Code, §11023). These TRI covered facilities would be required to develop source reduction and waste minimization plans for only the TRI listed chemicals that exceed threshold quantities established under EPCRA.

§335.474. Source Reduction and Waste Minimization Plans.

All persons identified under §335.473 of this title (relating to Applicability) shall prepare a five year (or more) source reduction and waste minimization plan which may be updated annually as appropriate according to the schedule listed in §335.475 (relating to Implementation Dates). Plans shall be updated as necessary to assure that there never exists a time period for which a plan is not in effect. Prior to completion of the plan and each succeeding plan, a new five-year (or more) plan shall be prepared. Plans prepared under paragraphs (1)-(3) of this section shall contain a separate component addressing source reduction activities and a separate component addressing waste minimization activities.

(1) With the exception of small quantity generators which are subject to paragraph (3) of this section, the plan shall include, at a minimum:

(A) an initial survey that identifies:

(i) for facilities described in §335.473(1), activities that generate hazardous waste; and

(ii) for facilities described in §335.473(3), activities that result in the release of pollutants or contaminants designated under §335.472 of this title (relating to Pollutants and Contaminants);

(B) based on the initial survey, a prioritized list of economically and technologically feasible source reduction and waste minimization projects;

(C) an explanation of source reduction or waste minimization projects to be undertaken, with a discussion of technical and economic considerations, and environmental and human health risks considered in selecting each project to be undertaken;

(D) an estimate of the type and amount of reduction anticipated;

(E) a schedule for the implementation of each source reduction and waste minimization project;

(F) source reduction and waste minimization goals for the entire facility, including incremental goals to aid in evaluating progress;

(G) an explanation of employee awareness and training programs to aid in accomplishing source reduction and waste minimization goals;

(H) certification by the owner of the facility, or, if the facility is owned by a corporation, by an officer of the corporation that owns the facility who has the authority to commit the corporation's resources to implement the plan, that the plan is complete and correct;

(I) identification of cases in which the implementation of a source reduction or

waste minimization activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium; and

(J) an executive summary of the plan which shall include at a minimum:

(i) a description of the facility which shall include:

(I) name of the facility;

(II) address;

(III) contact;

(IV) a general description of the facility; and

(V) Texas Air Control Board account number (TACB), Texas Water Commission (TWC) solid waste notice of registration number, TWC Wastewater permit number, United States Environmental Protection Agency (EPA) identification number (Resource Conservation and Recovery Act (RCRA) number), National Pollutant Discharge Elimination System (NPDES) permit number, and underground injection well code identification number.

(ii) a list of all hazardous wastes generated and the volume of each;

(iii) a list of all reportable TRI releases and the volume of each;

(iv) a prioritized list of pollutants and contaminants to be reduced;

(v) a statement of reduction goals;

(vi) an explanation of environmental and human health risks considered in determining reduction goals;

(vii) implementation milestones for individual project development;

(viii) an implementation schedule for future reduction goals; and

(ix) identification and description of cases in which the implementation of source reduction or waste minimization activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium. Included in this description shall be a discussion of the change in characteristic of the normal waste stream or release and how it will be managed in that affected medium.

(2) The source reduction and waste minimization plan may also include:

(A) a discussion of the person's previous efforts at the facility to reduce risk to human health and the environment or to reduce the generation of hazardous waste or the release of pollutants or contaminants;

(B) a discussion of the effect changes in environmental regulations have had on the achievement of the source reduction and waste minimization goals;

(C) the effect that events the person could not control have had on the achievement of the source reduction and waste minimization goals;

(D) a description of projects that have reduced the generation of hazardous waste or the release of pollutants or contaminants; and

(E) a discussion of the operational decisions made at the facility that have affected the achievement of the source reduction or waste minimization goals or other risk reduction efforts.

(3) The plans of small quantity generators shall include, at a minimum:

(A) a description of the facility which shall include:

(i) name of the facility;

(ii) address;

(iii) contact;

(iv) general description of the facility; and

(v) TACB account number, TWC Solid Waste Notice of Registration number, TWC Wastewater Permit Number, EPA Identification number (RCRA number), NPDES permit number, and underground injection well code identification number.

(B) a list of all hazardous wastes generated and the volume of each;

(C) a list of all reportable TRI releases and the volume of each;

(D) a prioritized list of pollutants and contaminants to be reduced;

(E) a statement of reduction goals;

(F) information on environmental and human health risks, such as Material Safety Data Sheets or other available documentation, considered in determining reduction goals;

(G) implementation milestones for individual project development;

(H) an implementation schedule for future reduction goals; and

(I) identification and description of cases in which the implementation of a source reduction or waste minimization activity designed to reduce risk to human health or the environment may result in the release of a different pollutant or contaminant or may shift the release to another medium. Included in this description shall be a discussion of the change in characteristic of the normal waste stream or release and how it will be managed in that affected medium.

(J) certification by the owner of the facility, or, if the facility is owned by a corporation, by an officer of the corporation that owns the facility who has the authority to commit the corporation's resources to implement the plan, that the plan is complete and correct.

(K) an executive summary of the plan which shall include at a minimum:

(i) a description of the facility which shall include:

(I) name of facility;

(II) address;

(III) contact;

(IV) EPA ID, TNRCC solid waste notice of registration number;

(V) primary SIC code.

(ii) a projection of the amount of hazardous waste that the facility will generate (based on what is reported as hazardous waste under 30 TAC 335.9) at the end of the five year period that the plan is in place.

(iii) prioritized list of pollutants and contaminants to be reduced.

(iv) a list of source reduction activities associated with reductions of pollutants identified under 335.474(3)(D).

(4) The executive summary may include:

(A) a discussion of the person's previous effort at the facility to reduce hazardous waste or the release of pollutants or contaminants through source reduction or waste minimization;

(B) a discussion of the effect changes in environmental regulations have had on the achievement of the source reduction and waste minimization goals;

(C) the effect that events the person could not control have had on the achievement of the source reduction and waste minimization goals; and

(D) a discussion of the operational decisions the person has made that have affected the achievement of the source reduction and waste minimization goals.

§335.475. Implementation Dates.

All facilities subject to this subchapter shall develop a source reduction and waste minimization plan. The implementation year shall be determined by the prior year's reported volumes of hazardous waste generated and/or total TRI releases. A facility once subject to this subchapter shall remain subject until it no longer meets the requirements of §335.473 of this title (relating to Applicability) or are exempted under §335.477 of this title (relating to Exemptions). Volumes for calculations will be based on total hazardous waste generated and/or total TRI releases. The executive summary shall be submitted to the commission and the board on the date the plan is required to be in place. Plan implementation will be according to the following schedule:

(1) The source reduction and waste minimization plan shall be in place, available for review, and shall be implemented no later than July 1, 1993 for:

(A) hazardous waste generators reporting 5,000 tons or more; or

(B) TRI facilities reporting 100 tons or more.

(2) The source reduction and waste minimization plan shall be in place, available for review, and shall be implemented no later than January 1, 1994 for:

(A) hazardous waste generators reporting less than 5,000 tons but more than or equal to 500 tons; or

(B) TRI facilities reporting less than 100 tons but more than or equal to 10 tons.

(3) The source reduction and waste minimization plan shall be in place, available for review, and shall be implemented no later than January 1, 1995 for:

(A) hazardous waste generators reporting less than 500 tons but more than or equal to 15 tons; or

(B) TRI facilities reporting less than 10 tons but more than or equal to 5 tons.

(4) The source reduction and waste minimization plan shall be in place, available for review, and shall be implemented no later than January 1, 1996 for:

(A) hazardous waste generators reporting less than 15 tons but more than or equal to 5 tons; or

(B) TRI facilities reporting less than 5 tons but more than or equal to 1 ton.

(5) The source reduction and waste minimization plan shall be in place, available for review, and shall be implemented no later than January 1, 1997 for:

(A) hazardous waste generators reporting less than 5 tons but greater than 1.102 tons (1,000 kilograms); or

(B) TRI facilities reporting less than 1 ton.

(6) After the effective date of this subchapter, any facility which becomes subject to the requirement to have a source reduction and waste minimization plan, either within 90 days prior to or at any time following the dates referenced in paragraph (1)-(5) of this section, shall have 90 days to have the plan in place and available for review.

§335.476. Reports and Recordkeeping.

All persons required to develop a source reduction and waste minimization plan for a facility under this subchapter shall submit to the commission and the board, concurrent with implementation of the plan under §335.475 of this title (relating to Implementation Dates), an initial executive summary of such plan and a copy of the certification of completeness and correctness in §335.474(1)(H) of this title (relating to Source Reduction and Waste Minimization Plans). Within 30 days of any revision of such plan, a revised executive summary including a copy of a new certificate of completeness and correctness shall be submitted. All owners and operators required to develop a plan under §335.473(1) and (3) (related to Applicability) shall also submit an annual report as defined below under paragraphs (1), (2), and (3) of this section according to the schedule outlined in paragraph (4) of this section. Persons required to develop a source reduction and waste minimization plan for a facility under §335.473(2) (related to Applicability) may meet the annual reporting requirements by submitting their annual waste summary required under 30 TAC 335.9 and by submitting their hazardous waste reduction goals as required under §335.474(K)(ii).

(1) The report shall detail the facility's progress in implementing the source reduction and waste minimization plan and include:

(A) an assessment of the progress toward the achievement of the facility source

reduction goal and the facility waste minimization goal;

(B) a statement to include, for facilities described in §335.473(1) of this title (relating to Applicability), the amount of hazardous waste generated and, for facilities described in §335.473(3), the amount of the release of reportable pollutants or contaminants designated under the Texas Solid Waste Disposal Act, the Texas Health and Safety Code Annotated, §361.433(c) in the year preceding the report, and a comparison of those amounts with the amounts generated or released using 1987 as the base year.

(C) any modification to the plan.

(2) The report may include:

(A) a discussion of the person's previous effort at the facility to reduce hazardous waste or the release of pollutants or contaminants through source reduction or waste minimization;

(B) a discussion of the effect changes in environmental regulations have had on the achievement of the source reduction and waste minimization goals;

(C) the effect that events the person could not control have had on the achievement of the source reduction and waste minimization goals; and

(D) a discussion of the operational decisions the person has made that have affected the achievement of the source reduction and waste minimization goals.

(3) The report shall contain a separate component addressing source reduction activities and a separate component addressing waste minimization activities.

(4) The report and the executive summary of the plan shall be submitted according to the following schedule and annually thereafter.

(A) For all facilities meeting the specifications of §335.475(1) of this title (relating to Implementation Dates), the first report will be due on or before March 1, 1994. The report will cover calendar year 1993. Subsequent annual reports will be submitted on or before July 1 of each year.

(B) For all facilities meeting the specifications of §335.475(2), the first report will be due on or before July 1, 1995. The report will cover calendar year 1994.

(C) For all facilities meeting the specifications of §335.475(3), the first report will be due on or before July 1, 1996. The report will cover calendar year 1995.

(D) For all facilities meeting the specifications of §335.475(4), the first report will be due on or before July 1, 1997. The report will cover calendar year 1996.

(E) For all facilities meeting the specifications of §335.475(5), the first report will be due on or before July 1, 1998. The report will cover calendar year 1997.

(5) Base line data from the calendar year 1987 shall be used in developing each of the first reports referred to in paragraph (4) of this section.

(6) The report shall be submitted on forms furnished or approved by the executive directors of the commission and the board and shall contain at a minimum the information specified in paragraph (1) of this section. Upon written request by the facility, the executive directors may authorize a modification in the reporting period.

§335.477. Exemptions.

(a) This subchapter does not apply to:

(1) conditionally exempt small-quantity generators; and

(2) facilities regulated by the Railroad Commission of Texas under the Natural Resources Code, §§91.101 or §141.012.

(b) Owners and operators of facilities listed in §335.473 of this title (relating to Applicability), may apply on a case-by-case basis, to the executive directors of the commission and the board for an exemption from this subchapter. The executive directors of the commission and board may grant an exemption if the applicant demonstrates that sufficient reductions have been achieved. If an exemption is granted, it is valid only for the following year, but can be renewed, on an annual basis, by filing a new application. The executive directors' decision will be based upon the following standards and criteria for determining practical economic and technical completion of the plan:

(1) the facility has reduced the amount of pollutants and contaminants being generated or released by 90% since the base year;

(2) potential impact on human health and the environment of any remaining hazardous waste generated, or pollutant or contaminant released; and

(3) a demonstration that additional reductions are not economically and technically feasible.

§335.478. Administrative Completeness.

The commission or the board may review a source reduction and waste minimization plan or annual report to determine whether the plan or report complies with this subchapter.

§335.479. Enforcement.

Failure to have a source reduction and waste minimization plan in accordance with this subchapter or failure to submit a source reduction and waste minimization annual report in accordance with this subchapter is a violation.

§335.480. Confidentiality.

(a) A source reduction and waste minimization plan shall be maintained at each facility owned or operated by a person and/or generator who is subject to this subchapter and shall be available to commission or board personnel for inspection. The source reduction and waste minimization plan is not a public record for the purposes of Chapter 424, Acts of the 63rd Legislature, Regular Session, 1973 (Texas Civil Statues, Article 6252-17a).

(b) The executive summary of the plan and the annual report are public records. On request, the person and/or generator shall make available to the public a copy of the executive summary of the plan or annual report.

(c) If an owner or operator of a facility for which a source reduction and waste minimization plan has been prepared shows to the satisfaction of the commission or board that an executive summary of the plan, annual report, or portion of a summary or report prepared under this subchapter would divulge a trade secret if made public, the commission or board shall classify as confidential the summary, report, or portion of the summary or report.

(d) To the extent that a plan, executive summary, annual report, or portion of a plan, summary, or annual report would otherwise qualify as a trade secret, an action by the commission or board or an employee of the commission or board does not affect its status as a trade secret.

(e) Information classified by the commission or board as confidential under this section is not a public record for purposes of Chapter 424, Acts of the 63rd Legislature, 1973 (Texas Civil Statutes, Article 6252-17a), and may not be used in a public hearing or disclosed to a person outside the commission or board unless a court decides that the information is necessary for the determination of an issue being decided at the public hearing.

Amendments to §335.476
Date Adopted: June 14, 1995
Date Filed with the Secretary of State: June 20, 1995
Date Effective: July 11, 1995

Ammendments to §335.474 and §335.476
Date Adopted: November 29, 1995
Date Files with the Secretary of State: December 4, 1995
Date Effective: December 25, 1995

Appendix D

Assessment of Risk

APPENDIX B & APPENDIX C NOT AVAILABLE

APPENDIX D

ASSESSMENT OF RISK

As mentioned in Chapter 3, this appendix offers a more detailed alternative for a human health risk assessment. You may also want to hire a consultant with experience in health and/or environmental risk assessment capabilities.

The concentration of a contaminant in ground water, surface water, air or soil should not exceed the Medium Specific Concentration (MSC) as determined by the procedures below.

For a contaminant which is a carcinogen, the MSC is the concentration which represents an excess upper bound lifetime cancer risk of one in one million or one in one hundred thousand (depending on the class of carcinogen as indicated in the list of factors below) due to continuous lifetime exposure as calculated using the formula and factors listed below:

1. Medium Specific Concentration $= \frac{(R)(BW)(LT)}{(CSF)(I)(A)(ED)}$

Using the following factors:

R	=	Risk for Class A&B carcinogens is 10^{-6}; Risk for Class C carcinogens, is 10^{-5} of an occurance per lifetime
BW	=	70 kg body weight
LT	=	70 year lifetime
CSF	=	carcinogenic slope factor in units of $(mg/kg/day)^{-1}$
I	=	2 L/day drinking water intake, or 20 m^3/day air inhalation, or 0.0001 kg/day soil ingestion
ED	=	70 year exposure duration
A	=	Absorption factor (use A=1)

For a contaminant which is a systemic toxicant, the MSC is the concentration to which human populations (including sensitive subgroups) could be exposed by direct ingestion or inhalation on a daily basis without appreciable risk of deleterious effects during a lifetime. It is calculated using the formula and factors listed below:

1. Medium Specific Concentration $= \frac{(RfD)(BW)}{(I)(A)}$

Using the following factors:

RfD	=	Reference Dose in units of mg/kg/day
BW	=	70 kg body weight for air, water; or 16 kg body weight for soil
I	=	2 L/day drinking water intake, or 20 m^3/day air inhalation, or 0.0002 kg/day soil ingestion
A	=	Absorption factor (use A=1)

Table 1. Examples of Maximum Concentrations.

Column A= Ground-Water: Maximum concentration in ground water; mg/L.[1][4][6][7]
Column B= Subsurface Soil/Ground-Water Protection: Maximum concentration in soil for no cross-media release to ground water; mg/kg.[2][6][7]

Column C= Subsurface Soil/Ingestion: Maximum concentration in soil for direct ingestion; mg/kg.[3][6][7]

Column D= Air: Maximum concentration in air; ug/m^3.[5][6][7]

Additional sources of information include:

National Library of Medicine - 1-800-638-8480
Texas Department of Health (TDH) - Epidemiology Division,TDH, 110 W. 49th, Austin, TX 78756 (512)458-7269
Texas Air Control Board (TACB) - Effects Evaluation Division, 12124 Park 35 Circle, Austin, TX 78753 (512)908-1784
Environmental Protection Agency (EPA) - Region 6, Managment Division, Policy & Analysis Section, 1445 Ross Ave, Dallas, TX 75202 (214)655-6570

Notes:
1 = Ground water concentrations based on MCLs or one of the following formulas:
Systemic Toxicants

$$\text{Concentration (mg/L)} = \frac{(RFD)(BW)}{(I)(A)}$$

RFD = Reference Dose (mg/kg/day)
BW = 70 kilograms body weight
I = 2 L/day ground water intake
A = Absorption factor (use A=1)

Carcinogens

$$\text{Concentration (mg/L)} = \frac{(Risk)(BW)(LT)}{(CSF)(I)(A)(ED)}$$

Risk = 10^{-6} for Class A and B carcinogens, 10^{-5} for Class C carcinogens, occurance per lifetime
BW = 70 kilograms body weight
LT = 70 year lifetime
CSF = carcinogenic slope factor $(mg/kg/day)^{-1}$
ED = 70 year exposure duration
A = Absorption factor (use A=1)
I = 2 L/day ground water intake

2 = Subsurface Soil Concentrations based on a dilution factor of 100 times the ground water standard

3 = Subsurface soil maximum concentrations based on one of the formulas which follow; this requires a demonstration that ground water is protected and that no nuisance conditions exist:

Systemic Toxicants

$$\text{Concentration (mg/kg)} = \frac{(RFD)(16kg\ body\ weight)}{}$$

(2E-04 kg/day soil intake)

Carcinogens

$$\text{Concentration (mg/kg)} = \frac{\text{(Risk)(16 kg body weight)(LT)}}{\text{(CSF)(1E-04 kg/day soil intake)(ED)}}$$

4 = Maximum Concentration Limit (MCL) from Section 141 of the Federal Safe Drinking Water Act

5 = Maximum concentrations for air based on one of the formulas which follow:

Systemic Toxicants

$$\text{Concentration (ug/m}^3\text{)} = \frac{\text{(RFD)(BW)}}{\text{(2E+01 m}^3\text{/day air intake)}}$$

Carcinogens

$$\text{Concentration (ug/m}^3\text{)} = \frac{\text{(RISK)(BW)(LT)}}{\text{(CSF)(2E+01 m}^3\text{/day air intake)}}$$

6 = Unless otherwise noted, all concentrations were calculated using the Intergrated Risk Information System (IRIS) Chemical Files, U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Office of Research and Development, Washington, D.C. 20460, (retrieved August 19, 1991).

7 = There may be other factors not considered in this table, including cumulative health effects and cross-media contamination as described in 31 TAC §335.8(f).

8 = Concentrations for constituents are expressed in scientific notation. Example: 2E+02 = 200; 2E-00 = 2; 8E-04 = 0.0008.

NA = No Data Available

Appendix F

Additional Resources

APPENDIX E - NOT AVAILABLE

APPENDIX F - ADDITIONAL RESOURCES
Waste Reduction Policy Act Information

1. TNRCC Publications

To order the following documents (use document number) call TNRCC publications at (512) 239-0028.

RG-133 Pollution Prevention Assessment Manual: Provides information on how to do a plan in compliance with WRPA. Also contains a copy of the rules and other helpful information.

RG-112 SR/WM Annual Progress Report Manual and Forms: Assists LQGs and TRI facilities in completing annual reporting required under WRPA.

RG-196 SR/WM Executive Summary and Certificate of Completeness and Correctness for SQGS: Provides information on how SQGs (who are not TRI reporters) fulfill their requirements under WRPA.

RG-209 Does the Waste Reduction Policy Act Apply to You?: Assists facilities in determining WRPA applicability and requirements.

2. TNRCC Online

Use your computer modem call TNRCC online at (512) 239-0700. Select the General menu, then the Pollution Prevention and Recycling menu, and download the applicable files. For help on how to access TNRCC online, call (512) 239-0911.

3. Industrial Pollution Prevention Team

Call (512) 239-3100 for help with WRPA requirements and ask to speak with someone on the Industrial Pollution Prevention team. We can clarify requirements and assist you in preparing your Plan, Executive Summary or Annual Progress Report.

You may also write to us at:

Office of Pollution Prevention and Recycling/TNRCC
IPP/TRI, MC112
P.O. Box 13087
Austin, TX 78711